

FRONTISPIECE.



A Nich in a Quoin in the Ruë nouve des Bons Enfans, at Paris.
This Plate is the 41.st Example of this Work.

A

PRACTICAL TREATISE

John Harrison.

ON

STONE-CUTTING.

IN FIVE PARTS.

CONTAINING,

PART I. *Of Plain Gates, and of Voussures, or Gates revealed, splayed and vaulted.*

PART II. *Of Vaults, Domes, and Groins.*

PART III. *Of the Concha, or Trumpet Arch.*

PART IV. *Of ascending and descending Vaults.*

PART V. *Of Stairs.*

PART THE FIRST.



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PRAC TICAL JOURNALIST



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DUBLIN:
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TO THE MOST NOBLE

MARQUESS of KILDARE,

E A R L of O P H A L E Y,

VISCOUNT LEINSTER of TAPLOW,

A N D

MASTER GENERAL of the ORDNANCE

O F

I R E L A N D.

MY LORD,

KILDARE HOUSE and CARTON, are each a Proof, and a Monument of your Lordship's Taste, for Architecture, and the Improvement of Nature; and it is only to such an exalted Spirit, as that which animates your Lordship in the Execution of great Designs, that Arts and Sciences owe the Honour they are held in, and their very Existence.

The Order, Regularity, and Perfection, to which your Lordship has, in a short Space of Time, brought the ORDNANCE of *Ireland*, from a most obscure and despicable State; the many able Artists and Mechanicks you have sought out, and encouraged to settle in this Kingdom; the daily Efforts you make to provide well for them; and your Singularity in spending the whole Income of such an Estate, as that of KILDARE, among your Countrymen; These, my Lord, among many others are most undeniable Proofs, that a generous Concern for your Country, and a Passion for every Thing, which is truly great and noble, actuate your whole Life and Actions.

These

DEDICATION.

These Considerations, oblige me to observe, to your Lordship in particular, That, at a Time, when so many excellent Authors daily publish useful and beautiful Designs in Architecture, it were to be wished, that the Execution of such Designs kept Pace with the Perfection, with which they have been laid down. But, many of our publick, and private Edifices, are Monuments of the contrary.

Such Defects and Ignorance, chiefly arising from the Want of Method, have induced me to publish the following Sheets. Your Taste, and your Zeal for the Welfare of this Land, oblige me to beg a Place for them under Your Lordship's Protection; who am

My LORD, with the utmost Respect

Your LORDSHIP'S

most obedient,

DUBLIN, 7th MARCH, 1765.

most humble Servant,



CHARLES VALLANCEY.

P R E F A C E.

AMONGST the Sciences which Architecture comprehends, that of STONE-CUTTING is without Contradiction, one of the most considerable, and most useful, for on the exact Form and Bondage of the Stones of Arches, Vaults, &c. depends the Beauty as well as Solidity of the Building.

This SCIENCE compared with Architecture in general, is of a modern Invention; *Philibert de Lorme* was the first that reduced it to Rules. The CONCHA or overhanging Arch, which he constructed at the Castle of *Anet*, to support the Cabinet of *Henry II.* is a Proof of his Capacity, but his Treatise is obscure, and he has given very few Examples.

Mathurin Jousse left many Plans and Schemes, but is not more intelligible; these two Authors say nothing of the Method of forming the Stones.

Desargues, whose Works were published by *Bosse* the Engraver, stole his Treatise from the other two, to which he added such new Terms, as renders it of as little Use, as the former.

Jacques Curabelle republished *Desargues*, with Notes, and corrected many Faults; it is to be wished that *Curabelle* had left a Treatise on Stone-cutting, as it is evident, he was as well acquainted with the Practice as the Theory.

The Jesuit *Derand* succeeded better than his Predecessors; but he begun his Work with some of the most difficult Constructions in the Art; and is unintelligible to the Practitioner or Workman.

The antient Authors of Architecture, give no particular Rules for this most essential Part of the Science, some explain a few technical Terms of it, but none treat of the Method of finding the Shape or Moulds of each Stone, the modern Authors are as defective in this Point, as the Antients, they have indeed shewn how to form the Centres for all kinds of Vaults, and how to draw the joint Lines of the Voussiors. The Architect must therefore leave the Solidity of his Work, in great Measure, to the Discretion of the Stone-cutter.

P R E F A C E.

We have begun by the most simple and plain Construction, leading the Reader by degrees to those more compounded, and when any Plan could be executed by various Methods, the shortest and most exact, has always been chosen; and to avoid swelling the Work too much, those Plans most frequently occurring in Practice, are treated of, yet if the Reader perfectly understands what is here presented to him, he will be able to execute every Thing that can possibly occur in the Art of Stone-cutting.

As this Treatise is intended for the Workman, the most familiar Terms are made use of, as well as the plainest Language.

Every one experienced in Works of this Kind must be sensible of our great Defect in the Terms of Art, those of one Part of the Kingdom, having a Meaning diametrically opposite to those of another, for the same Thing; it is to be wished, that at a Time, when there are so many eminent Architects, and Builders, that they would fix upon such as may be establish for the future. On this Account, we have, as an Introduction to this Work given the Explanation of such Terms, as occur in the following Sheets, and of the principal Instruments used by the Workman.

The Work is divided into five Parts. The first, treats of plain arched Gates, and of Gates revealed and splayed, whose Retreats are spherically vaulted, spring from the various Arches of the Gate, either curved or straight; these are called *Voussures*.

The second Part, treats of all Kinds of Vaults, Domes, and Groins.

The Third, of the overhanging Arch, or CONCHA of *Vitruvius*, by some called the Trumpet Arch.

The fourth of ascending and descending Vaults; and

The fifth and last, treats of Stairs.

The Theory of Stone-cutting depending on the Sections of Solids, there is added a small Treatise of STEREOTOMY, as far as may be useful to the Workman only.

It is recommended to the Learner, to draw every Plan as he goes on, placing every Letter and Figure in the Original, then to cut some Stones in the Manner here described, taking Care to dispose of them as directed, and to compare them with the Figures in the Plates.

If any Architect, Stone-cutter, or other skilled in this Art will be pleased to communicate to the Author, any Methods, more correct, or more concise, than those made use of in the following Sheets, they will be, thankfully received, and inserted, in the Course of this Work.

P A R T



P A R T I.

Of plain Gates, and of Gates with Reveals and Splays,
spherically vaulted over the Retreats.

C H A P T E R I.

Of the Names and Use of the principal Terms, and Instruments used in this Art.

STONE-CUTTING is the Art of assembling together a Number of Stones dressed by the Square, or by Moulds, which being placed one on another, form one solid Body, according to the different Forms of the Vaults to be constructed: But to find the Shape and Form of each Stone, a TRACE must be drawn, which is, the Plan and Elevation of the Vault or Arch, as large as the Work is to be, laid down on a straight and smooth Area or Superficies, such as a Wall, or a Floor, by Means of which, and the Profiles, all the Areas, Curves, or Sides, &c. are found, to form the Moulds of the Heads, Joints, upper and under Curves of each Stone.

These Moulds, whose Figures are sometimes composed of right Lines and sometimes of right and curved Lines mixed, are commonly made of thin Deal, or Oak, and have each a particular Name, according to the Side of the Stone to which it is to be applied.

The Head and Tail of the Stone, are those Faces of it, seen in the Front and Rear of an Arch.

The Sheeting or under Curve, is the hollowed Part of the Stone, which forms the Concavity of the Vault or Arch.

The Extrados Crown or upper Curve, is that Side which forms the Convexity of the Arch, and is opposite to the Sheeting.

The Joints, or Beds, are those Sides of the Stone, which rest one against the other, and are formed by Lines drawn from the Center of the Arch or Vault.

The Compass, Ruler, Square, Level and Plumb are too well known to require any Description here.

The

The Bevel is composed of two Rulers, fastened at one of their Ends by a Screw or Rivet, which move like the Legs of a Compass, its Use is to take the opening of right-lined Angles.

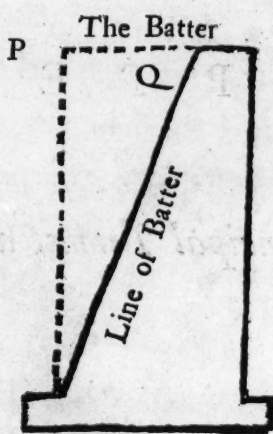
The curved Bevel differs from the former, in having one or both Sides of one Leg curved, and serves to take mixt, or curvilinear Angles.

Vouffoirs, are the Stones which form the Arch.

The Vouffoir directly over the Center of the Arch, is called the Key-stone.

Sommers are the first Stones of an Arch, laid on the Impost, whose under Bed is horifontal, and the upper Bed, an inclined Plane, to receive the first Vouffoir, as A C.

Batter signifies the Variation of a sloping Wall, from a Perpendicular, erected at the Foot of the Wall; caused by the Diminution of the Thickness at Top, as P Q.

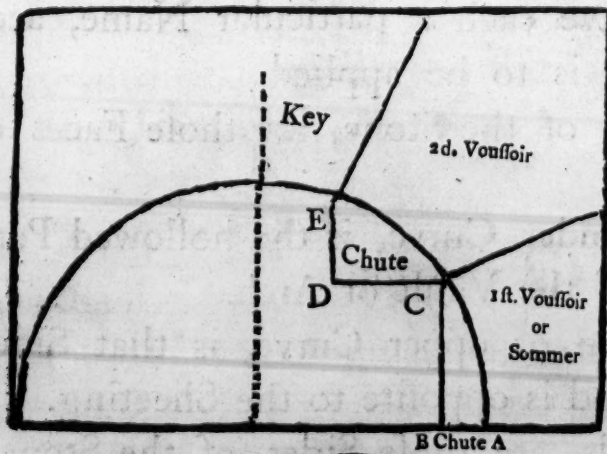


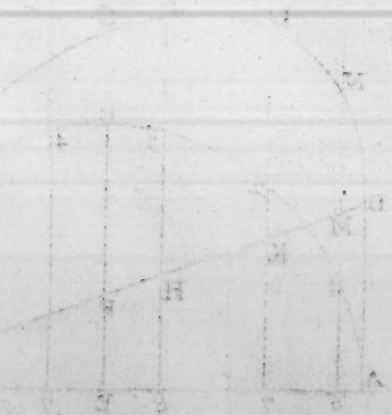
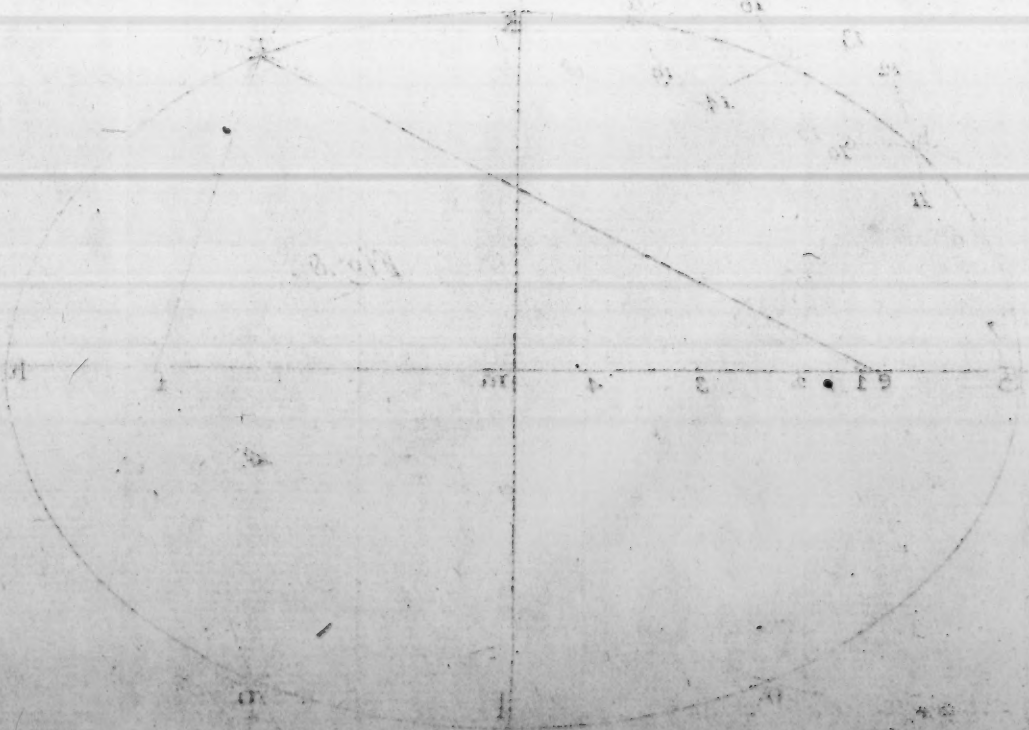
The Arras of a Stone is the Edge of it.

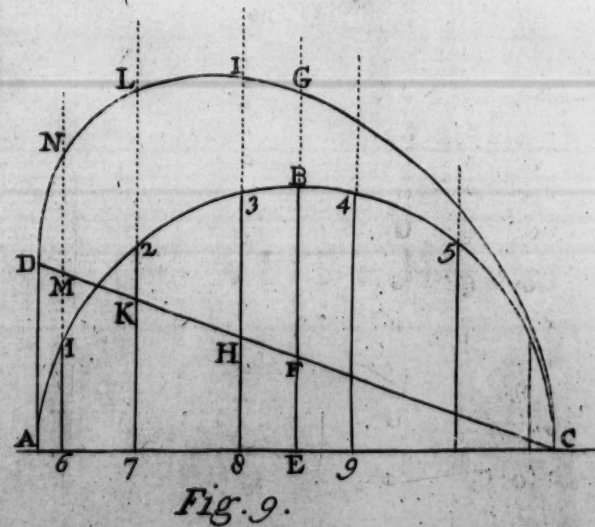
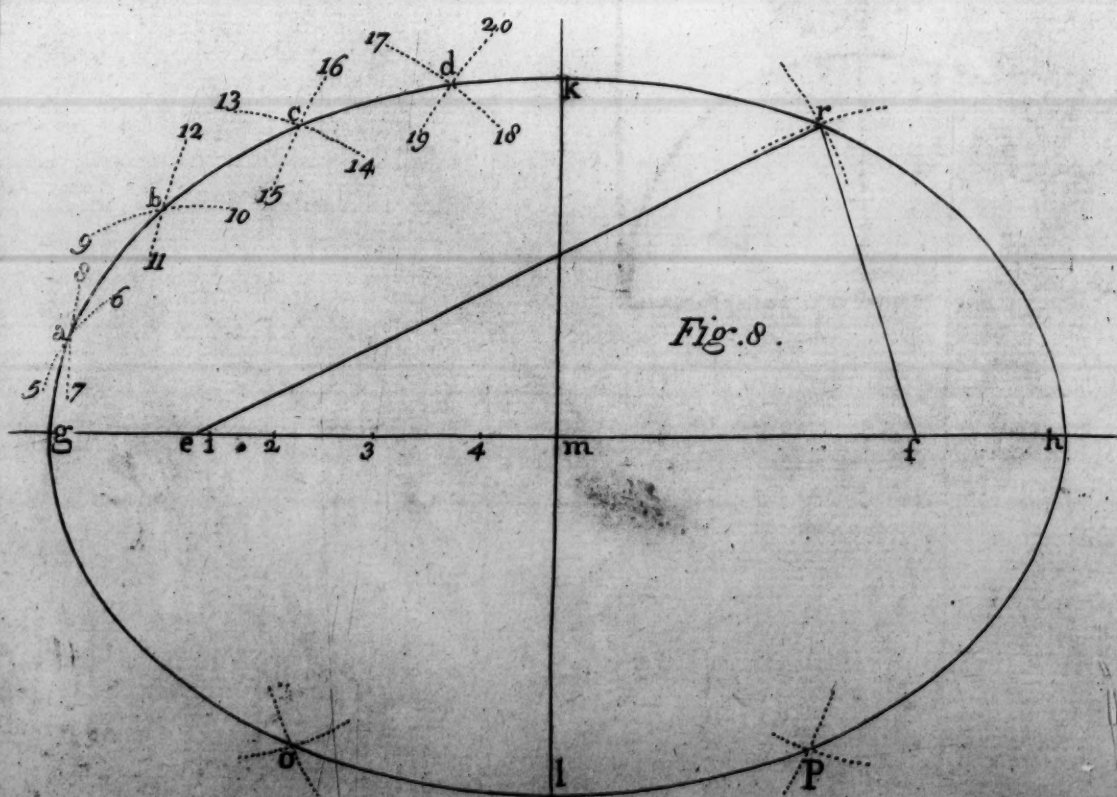
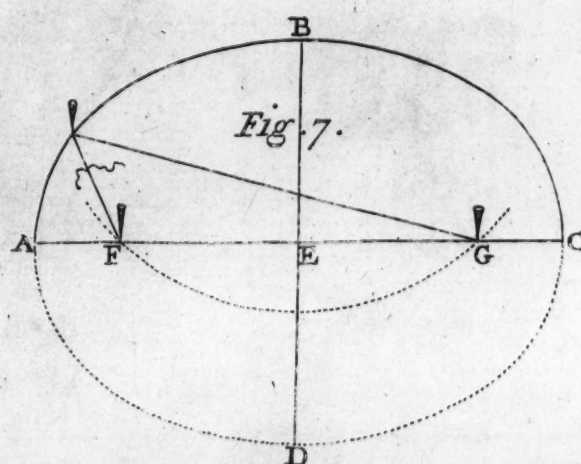
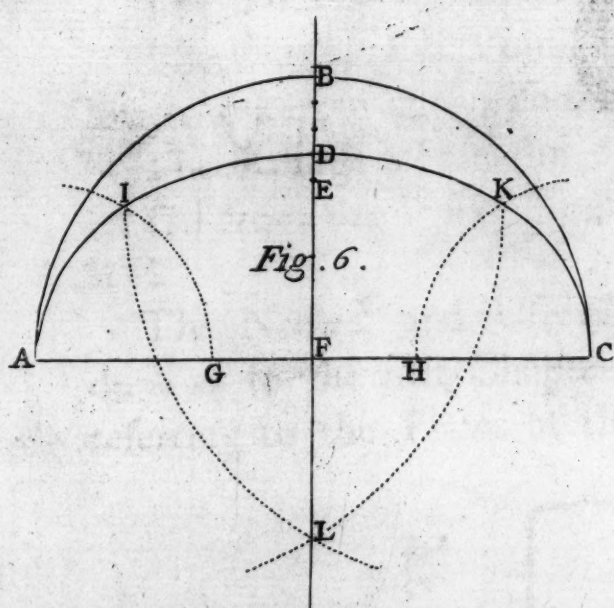
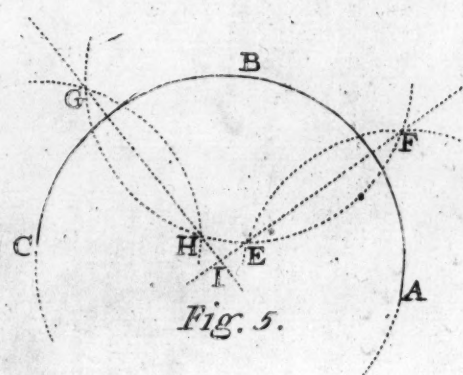
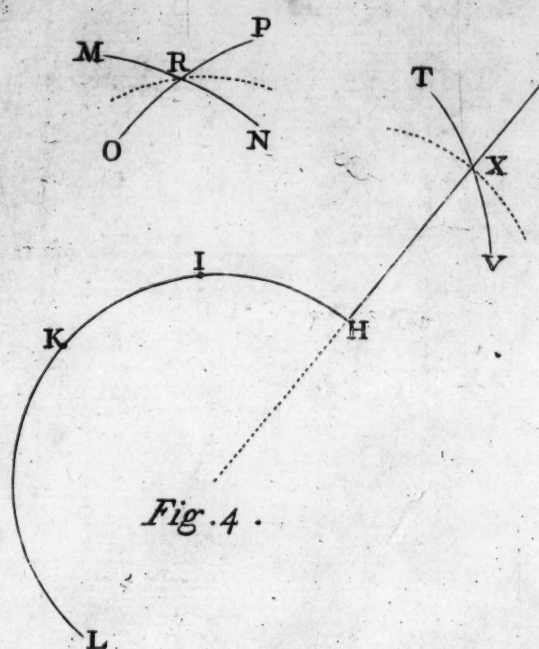
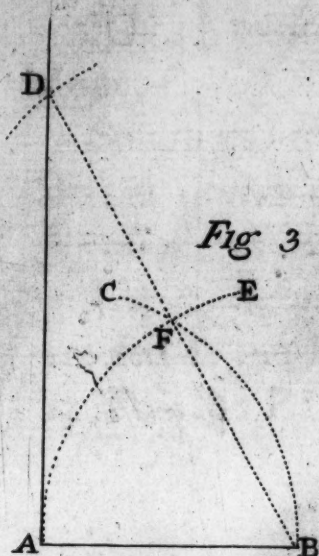
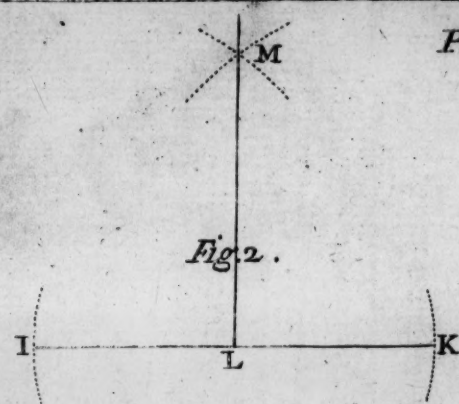
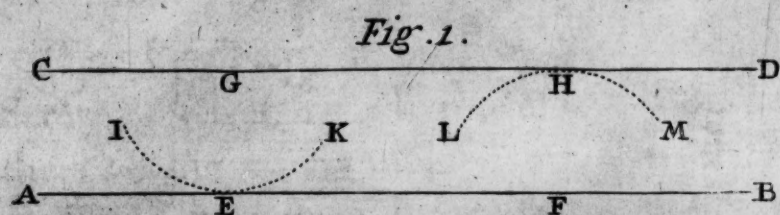
The Chute, of a Vouffoir, is the Projection of the upper Joint beyond the lower, taken in an horifontal Direction, as A B, C D.

The Rising or Height of the Chute, is the Measure of a Perpendicular let fall from the Upper Joint of a Vouffoir, until it cuts the Chute, as D E, B C.

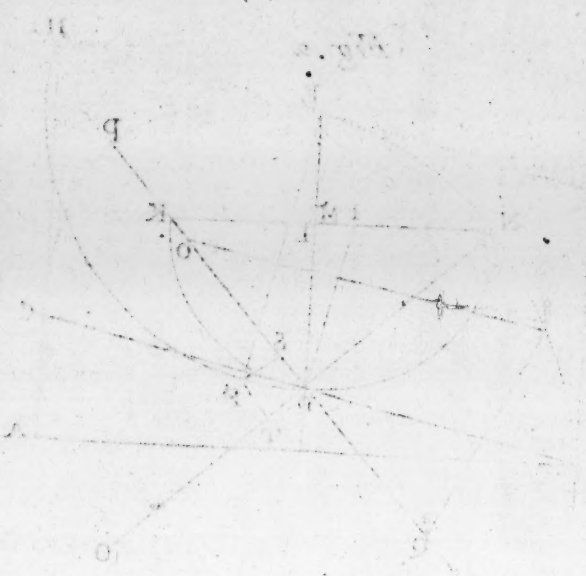
The Names, and Use of the different Vaults, shall be given as an Introduction to the first Chapter of each Part, which will be better understood by referring to the Plates at the same Time.







PL. 2.



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CHAPTER II.

Of some Principles of Geometry. Plate 1, 2.

THROUGH a given Point to draw a right Line parallel to a Line given:
Fig. 1.

Let G be the Point given thro' which the Line CD is to be drawn parallel to the Line AB.

From the Point G, describe the Arc IEK, so that it touches the Line AB from the Point F taken at pleasure on the Line AB, and with the same opening of the Compass, describe the Arc LHM, and thro' the Point G draw the Line required CD, touching the Arc LM in H.

To raise a Perpendicular on a Point given in the middle of a right Line.
Fig. 2.

Let L be the given Point on the Line IK.

From the Point L describe at pleasure the Arcs I and K with the same opening of the Compass; from the Points I, K, make the Section M, from the Point I, draw the Line LM through the Section, and it will be the Perpendicular required.

To raise a Perpendicular at the Extremity of a given right Line. Fig. 3.

Let A be the Extremity of the Line proposed.

From the Point A as Center, and the Interval AB describe at pleasure the Arc BC; from the Point B as Center, and the same Interval, describe the Arc AE; from the Point F, the Intersection of the two Arcs, and with the same Interval, describe the Arc D; draw the Line BD through the Sections B and F, and from A to D draw the Perpendicular required.

Having given the Portion of a Circle whose Center is lost, to draw a right Line, which shall pass through the Center, Fig. 4.

Let HL be the Portion of a Circle.

From the Point H make at pleasure the equal Distances HI, IK; from the Points K and H draw at pleasure the Arcs MN, OP, which intersect in R; from the Point I, with the same opening, describe the Arc TV; then from the Point H as Center, and the Interval IR, describe the Arc X, which cuts TV in the Point H; through the Points X and H draw the Line proposed HX.

To describe a Circle through three given Points, Fig. 5.

Let $A B C$ be the Points through which the Circle is to pass.

From the Points A and B make the Sections $E F$; draw the Line $E F$; from the Points B and C make the Sections G, H , draw the Line $G H$ till it cuts $E F$; the Intersection I will be the Center of the Circle, which will pass through the given Points.

To describe a semi-oval the Diameter and Height being given. Fig. 6.

Let $A C$ be the Diameter and $F D$ the Height.

From the Point F , the Middle of $A C$, describe the Arc $A B C$, divide the Interval $B D$ into three equal Parts, one of which carry below D to E : From the Points A and C as Centers, and the Interval $F E$, describe the two Arcs $G I$, and $H K$; from the Points G and H and with the same opening describe the Arcs $A I$, and $C K$ which cut the first in the Points I and K , from which as Center and the Interval $I K$, describe the Arcs $K L$, $I L$; from the Center L describe the Arc $I D K$, which will form the Semi-oval required.

To draw an Oval or Ellipsis with a Cord or Thread, the two Diameters being given. Fig. 7.

Let $A C, B D$ be the given Diameters.

From the Point B as Center, and with the Interval $A E$ or $E C$ describe the Arc $F G$, which cuts the Line $A C$ in the Points $F G$; in F, G place two Nails, or Pins which shall be immovable; place a third in A , pass the Cord round the Nail G , and fasten the two Ends close at A , take up the Nail A and with it and the Cord describe the Oval demanded.

To draw an Ellipsis by another Method. Fig. 8.

Let $g h$ be the greater, and $k l$ the lesser Diameters, e and f the two Foci.

On the Line g, h make at pleasure the Divisions 1. 2. 3. 4. between the Points e, m : with the Interval $g 1$ and from e as Center, describe the Arc 5—6: with the Interval h, i , and from the Focus f as Center describe the Arc 7—8 which cuts the Arc 5—6 in the Point a , through which must pass the Ellipsis: then from the Focus e as Center, with the Interval $g 2$ describe the Arc 9—10; from f , with the Interval $h 2$ describe the Arc 11—12 which cuts 9—10 in b , through which must also pass the Ellipsis: from the Focus f with the Interval $h 3$ make the Arc 13—14 which cuts 11—12 in the Point c ; from the Focus e with the Interval $g 4$, make the Arc 15—16 which cuts 13—14 in the Point d , through which and the Points $k c b a g$ describe by hand the fourth Part of the Ellipsis $k c g$.

In the same Manner the Ellipsis is to be compleated, but it must be observed that if from the two Foci e and f Lines are drawn meeting in the Circumference

ference as at r , the Lines er , fr , will together be equal to the greatest Axis $g-h$.

To draw a rampant, or surmounted Arc, from a Semi-circle. Fig. 9.

Let ABC be the Semi-circle. AD the Height of the Ramp, and DC the Line of the Ramp. Divide the Semi-circle into any Number of Parts as 1 2 3 4, &c. elevate from the Divisions, the Perpendiculars to AC , as 6 $N-7 L-8 I$, &c. above the Line of the Ramp. Carry the Heights of the Semi-circle 6-1, 7-2, 8-3, EB , &c. on MN , KL , HI , FG , &c. by this Means any Number of Points may be found, through which may be drawn by Hand, the rampant Arc DGC required.

To draw a rampant Arc, with the Compasses. Plate 2. Fig. 1.

Let AD be the Height of the Ramp, BD the Line of the Ramp, and LK perpendicular to the Middle of AB .

Make LK equal to LB , draw KB ; from the Point E the Middle of KB draw EF perpendicular to KB , to find the Point F on AB ; draw FK ; draw DI parallel to AB , to find the Point, the Point I on KF ; from the Point I with the Intervals ID describe the Arc DHK ; from the Point F with the Interval FK describe the Arc KGB , these two Arcs, will together form the rampant Arc demanded $DHKG B$.

To trace a rampant Arc with a Cord or Thread, the Span, Ramp, and Height of the Arc in the Middle of the Span being given. Pl. 2. Fig. 2.

Let AB be the Span, AC the Height of the Ramp, CB the Line of the Ramp, E the Point designed for the Height of the Arc, in the Middle of AB .

Through the Point E draw GH parallel to BC : draw EF perpendicular to GH ; make EF equal to EH ; through the Points F and D , draw FD , make DI parallel to EF , draw KN at pleasure parallel to FD ; divide IL into two equal Parts in M , from which as Center and with the Interval MD describe the Semi-circle KDN ; from the Center D through K and N draw the Diameters DP and DO ; make FT parallel to PP and FS parallel to OO , make the Distances DO , DO equal to ES and the Distances DP , DP equal to ET ; from the Points O , O as Centers and with the Interval DP make the two Sections QQ on PP , which are the Foci, O , O and PP are the two Diameters of an Ellipsis, which will trace the rampant Arc required $BOEPC$, by making the Thread fast at Q , Q and stretching it to the Point B , from whence carry it on to E and C .

The Circumference of an Ellipsis being given, to find the Diameters. Fig. 3.

Let $ABCD$ be the Circumference given.

Draw at Pleasure the parallel Lines 1. 2. 3. 4. and divide each into two equal Parts in 5 and 6; draw through these Points the Line 7-8: divide the
Interval

Interval 7—8 into two equal Parts in the Point 9, from which as Center, describe at Pleasure the Arc 10, 11, 12 so that it cuts the Circumference of the Ellipsis as in 10. 11. 12. Through 10. 11. draw 10. 11. and draw also 11. 12. Through the Center 9 draw CD parallel to 10. 11. and AB parallel to 11. 12. The Lines AB, CD will be the Diameter required.

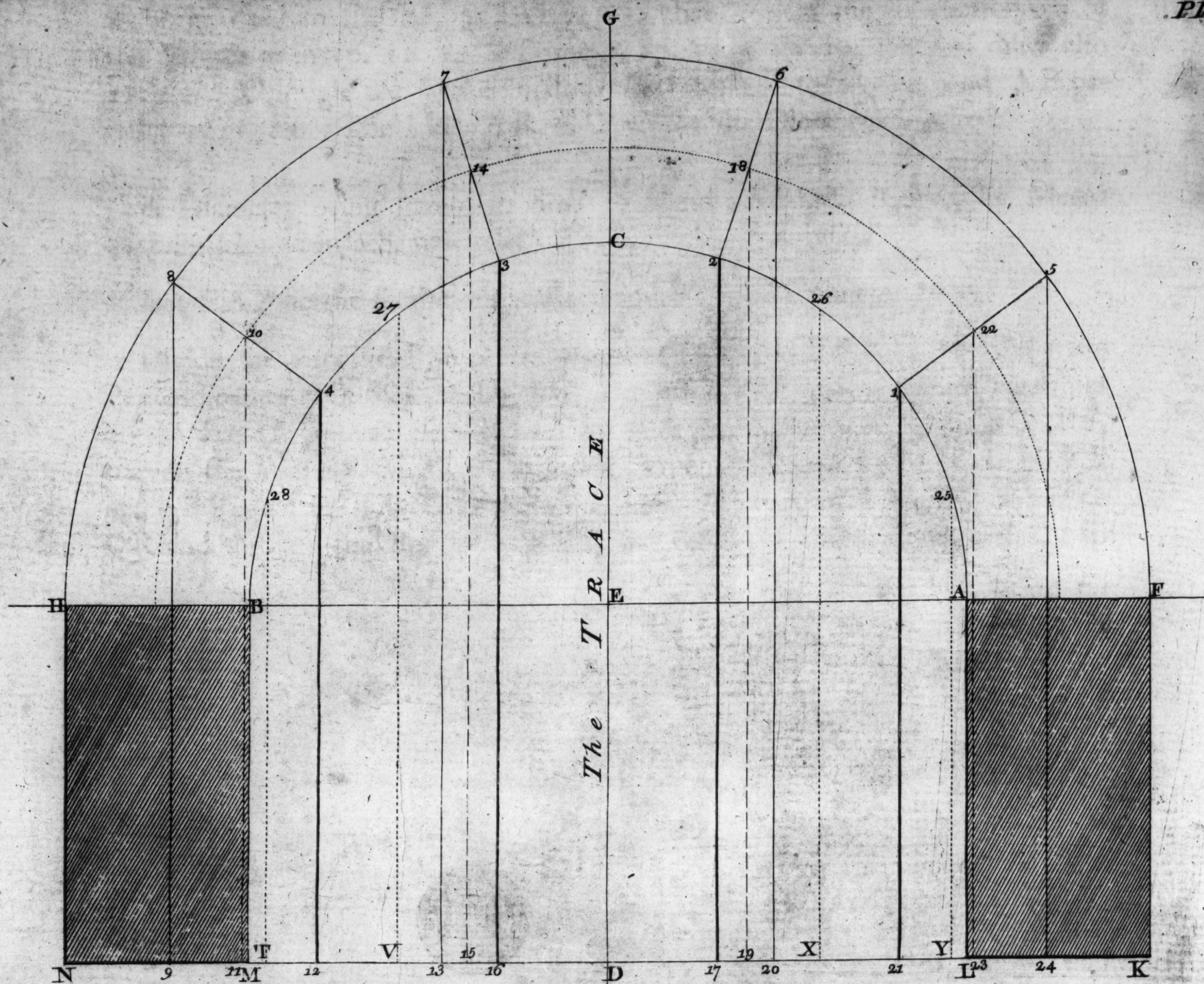
A Diameter being given, to draw by Hand a sur-based Curve, by Means of Points found in a Semi-circle. Fig. 4.

Let EAP be the semi-circular Arc, and EO the Diameter given.

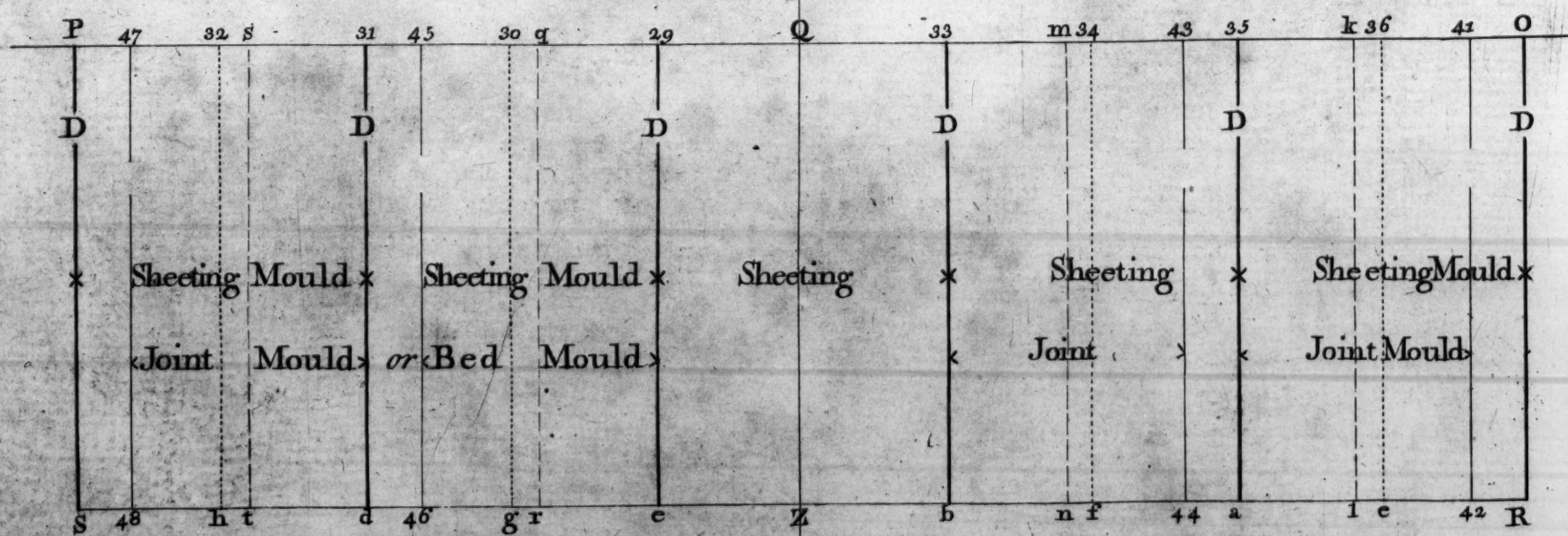
Divide the Arc EAP into any number of Parts as PRKC, &c. draw the Perpendiculars RQ, KL, CD, AB, &c. draw PO through the Extremities of the two Diameters; parallel to PO draw the Lines QS, LM, DG, BF, &c. on the Points S, M, G, F, raise the Perpendiculars ST, MN, GH, FI, make FI equal to BA, GH equal to DC, NM equal LK, ST equal to QR and through the Points TNHI, &c. trace the Curve demanded OIE.

CHAPTER





A straight Gate with a semicircular Arch.



The Moulds.

CHAPTER III.

Of the Method of drawing the TRACE of straight semicircular Arches, and of finding the Moulds for the Faces of each Stone. Plate 3.

AS this TRACE must serve as a standing Rule for the following, it will be proper for the Practitioner to draw it over several Times, until he can do it without referring to the Explanation or the Figure, as all other TRACES only differ from it according to the different Kind of Arch to be constructed, such as the bevell'd Arch, that in a battering or sloping Wall, and that in circular Walls, &c.

OPERATION.

Draw two Lines perpendicular to, and crossing, each other as AB, CD, from the Point E as Center describe the sheeting Curve ABC, and the Extrados, or upper Curve FGH: divide these two Arcs into two equal Parts by the dotted Arc 22-14-10: draw LM parallel to AB, and make the Distance BM equal to the Thickness of the Wall in which the Gate is to be constructed. Draw the outer and inner Lines of the Plan FK-AL-BM-HN parallel to CD: divide the Arc ACB into any number of Parts, so they be unequal, suppose five, by the joint Lines 1. 2. 3. 4. from the Point E draw the Joints 1-5, 2-6, 3-7, 4-8, then from every Point where the Joints cut the Arcs ACB, FGH, &c. as from the Points 8-10-4, 7-14-3, &c. on KN let fall the Perpendiculars 8-9, 10-11, 4-12, 7-13, 14-15, 3-16, 2-17, 18-19, 6-20, 1-21, 22-23, and 5-24: divide the Sheeting of each Voussoir A 1, 1-2, 2-3, &c. each into two equal Parts, in 25, 26, 27, 28, from which also let fall the Perpendiculars 25 Y, 26 X, 27 V, 28 T.

To draw the Moulds of the Sheeting.

Below the Trace draw a Line OP parallel to the Line KN; prolong ED to Z, make the Distance QZ equal to ED; thro' Z draw the Line RS parallel to OP, then on each Side QZ lay off the Distances C 3 on Q 29, 3-27 on 29-30, 27-4 on 30-31, 4-28 on 31-32, and 28 B on 32 P; on the other Side lay C 2 on Q 33, 2-26, 26-1 on 34-35, 1-25 on 35-36, 25 A on 36 O: Through the Points O 35-33-29-31 P let fall on RS the Perpendiculars OR, 35 a, 33 b, 29 c, 31 d, PS: Through 36-34-30-32 let fall the Perpendiculars from the Middle of the Sheetings 36 e, 34 f, 30 g, 32 h. The Distances DD give the Breadth of the sheeting of each Stone in the sheeting Curve.

D

To

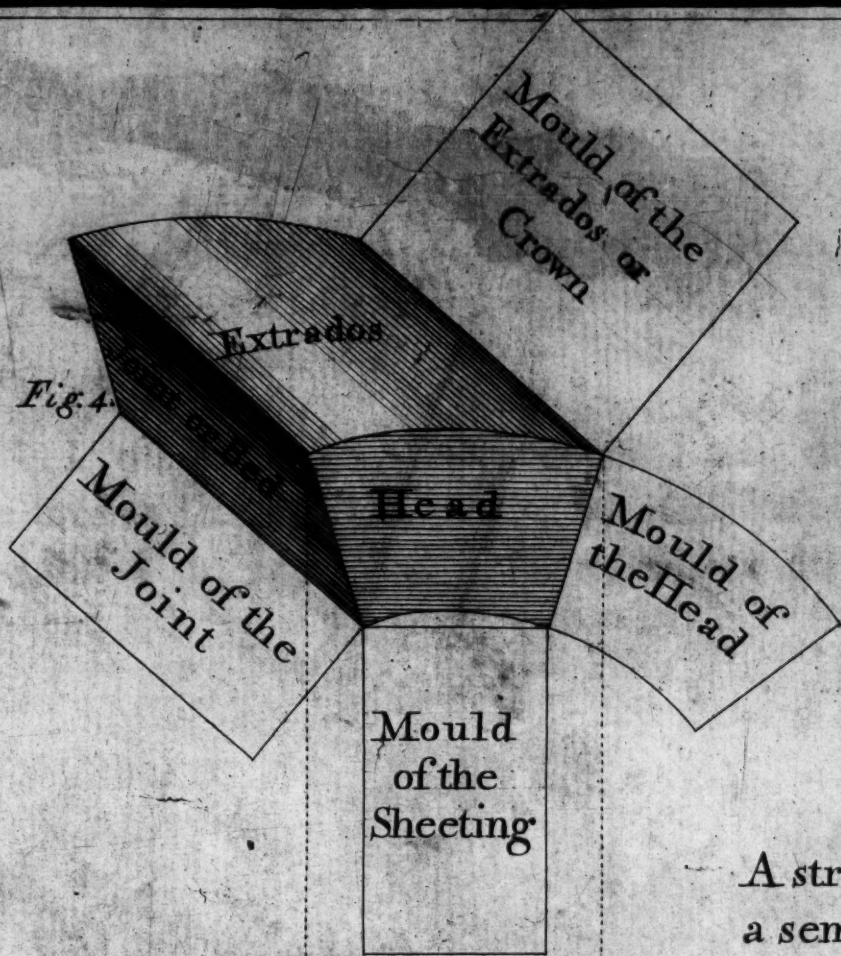
To draw the Moulds of the Beds or Joints.

Lay off the Distance 1-5 on 35-41, on 33-43, on 29-45, on 31-47 and through the Points 41-43-45-47 draw the Lines 41-42, 43-44, 45-46, 47-48 parallel to QZ: To find the Middle of the Joint, divide the Distances 35-41, 33-43, 29-45, 31-47 each into two equal Parts as in k m g s, through which draw the Lines k l, m n, q r, s t parallel to QZ.

The Distances I, I, are the Breadths of the Joints; the Lines D, D, those of the Sheeting I, I, the Joints: The five dotted Lines, the Middle of the Sheeting, and the broken Lines the Middle of the joint Faces.

N. B. The Moulds of the upper Bed or Joint, of one Stone serve for the under Bed of the next.





A straight Gate with a semicircular Arch.

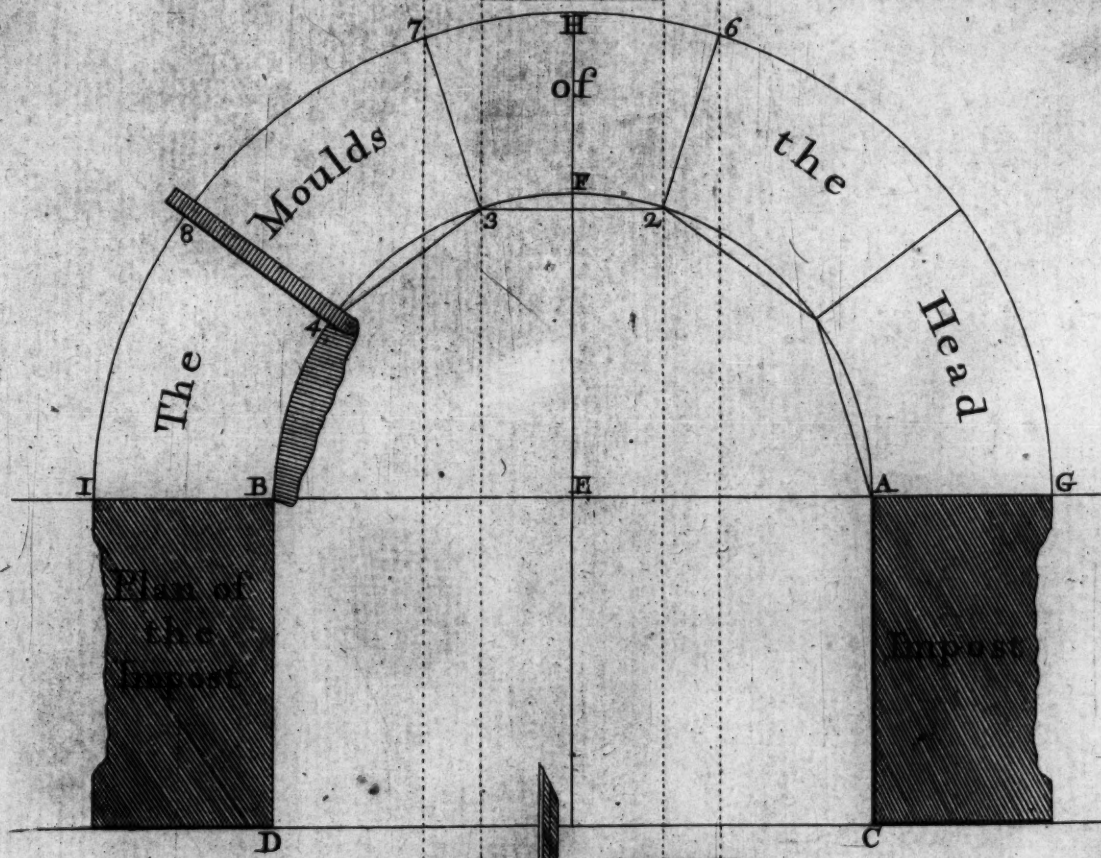


Fig. 3.

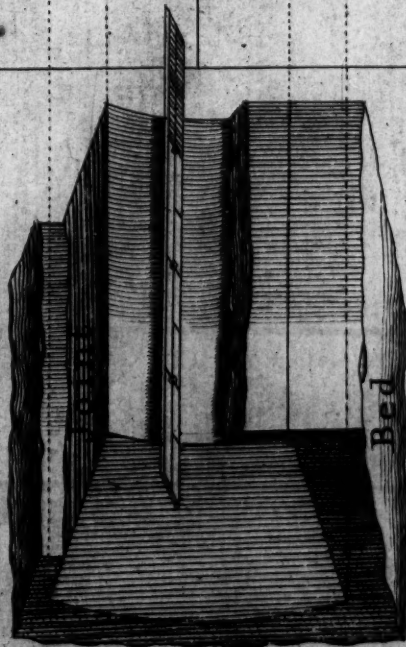


Fig. 2.

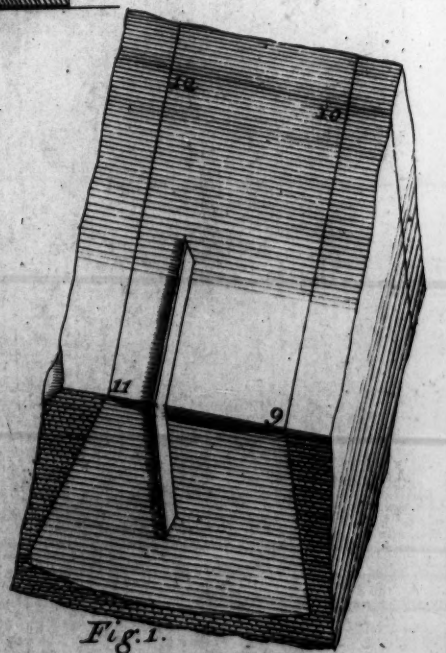


Fig. 1.

CHAPTER IV.

Of a straight Gate with a semicircular Arch. Plate 4.

LET ABCD be the Plan of the Gate proposed; divide the Opening into two equally by the Perpendicular EF, and from the Point E as Center describe the Sheeting AFB and the Extrados GHI: divide the two Arcs into five equal Parts by the Points 1-2-3-4 and from the Center draw the joint Lines 1-5, 2-6, 3-7, 4-8, these Lines with the two Arcs will form the Heads of the Voussoirs.

The Perpendiculars from the Chutes, and those from the middle of the Sheatings are not drawn in this Plan, as the Voussoirs may be traced without making a Mould for each Face of the Stone, by having the Head of the Voussoir and Thickness of the Wall only, in the following Manner.

Chose a Stone long enough to go through the Wall, and of a Breadth and Height capable of containing the Dimensions of the Head of a Voussoir as 2-3-7-6; dress the Side intended for the Sheeting, so that it does not wind; on which lay down the two parallel Lines (Fig. 1.) 9-10, 11-12, distant from each other the Breadth of the Sheeting 2-3, then square one End, to 9-10 as 9-11, and parallel to 9-11 draw 10-12 distant from 9-11 the thickness of the Wall, square the Head and Tail, on which apply the Head of the Voussoir 2-3-7-6 so that its Extremity 2-3 be exactly on 10-12 and on 9-11 as is represented in Fig. 1; then hollow the Sheeting, and cut the Joints or Beds, according to the Trace, as is shewn in Fig. 2.

Fig. 3. represents a Voussoir finished, the rest are formed in the same Manner: instead of drawing the Heads of the Voussoirs on the Stone, a Bevel formed to the Curve of the Arch, may be used, as B-4-8.

Fig. 4. is a Voussoir accompanied with the Moulds of each Side of the Stone, which will explain what was said in Chap. 2. should the Learner not comprehend that TRACE.

The Voussoirs of Elliptical Arches are cut by the same Method as the above, except that Moulds must be made for each Head, to give the first Form to the Voussoirs, and taking Care not to reverse the Joints, by placing the upper Bed instead of the lower: Besides the Moulds are not alike except in the breadth of the Sheeting, and the Angle formed by the Sheeting and the upper Bed, is not equal to the Angle formed by the Sheeting and under Bed; the Reason of which is that the Joints of an Elliptical Arch, do not all proceed from one Center, and besides the Arch is less curved in the middle than at the Hanches.

CHAPTER V.

Of a Gate bevelled in Front, with a semi-circular Arch, traced by Moulds and by the Square. Plate 5.

THIS Gate is said to be bevelled because the Imposts CE, DF are not square to the Front AB; it differs from the preceding only in its Obliquity, which will require more Trouble in the TRACE.

Let the TRACE be made as before, to which add the Perpendiculars of the Chutes of the Sheetings, of their Centers, and those of the Joints as in Pl. 5. and from the Extremity of the Impost A draw the Line of Obliquity, or Bevel AB.

To give the Bevel to the Sheetings,

Draw the parallel Lines LM, NO distant from each other the Line AG and on each Side of the Perpendicular 38 R, lay off the Sheetings, and of their Centers or Middles (as in Chap. 4.) The Lines being drawn, lay down the Bevels in the following Manner.

Lay the Interval 2 C on L 29: 3-4 on 30-31, 5-6 on 32-33, 7-8 on 34-35, 11-12 on 36-37, 13-14 on 38-39, 15-16 on 40-41, 19-20 on 42-43, 21-22 on 44-45, 23 D on 46-47 and HD on M 48: then draw by Hand the pricked Line 29-31-33-35-37-39 and -48 which will give the Sheetings the proper Bevel.

To give the Bevel to the Joints.

Take the Height of the Joint IK and lay it off to draw the joint Lines 52d-50e-54f-56 T, parallel to the Lines of the Sheetings 37a-32b-41-c 45-s as in Chap 4: then by the Distances 9-10 on 51-52, 26-27 on 49-50, 17-18, on 53-54 and 24-25 on 55-56: and draw the Lines 33-50, 37-52, 41-54 and 45-56.

To trace the Vouffoirs by Moulds.

Draw one of the Heads of a Vouffoir, according to which all the rest must be cut as if the Arch was square on both Sides. To trace the Sommer or first Vouffoir placed on the Impost FDB, apply the Plan of the Impost on the under Bed of the Stone (as in Fig. 1.) so that the Side DF, be on the under Arras of the Sheeting 67-68; this done, apply on the Sheeting the first Mould S 45-48 O, placing its Side O 48 between the Points 67-68: then on the upper Bed apply the first Mould of the Joint placing its Side S 45 between the Points 69-70: having thus gone round the Vouffoir with its Moulds and having traced them as in Fig. 1. cut the Stone according to the Lines and the

A Gate, bevel'd in Front, with
a semicircular Arch, trac'd by
Moulds, and by the Square.

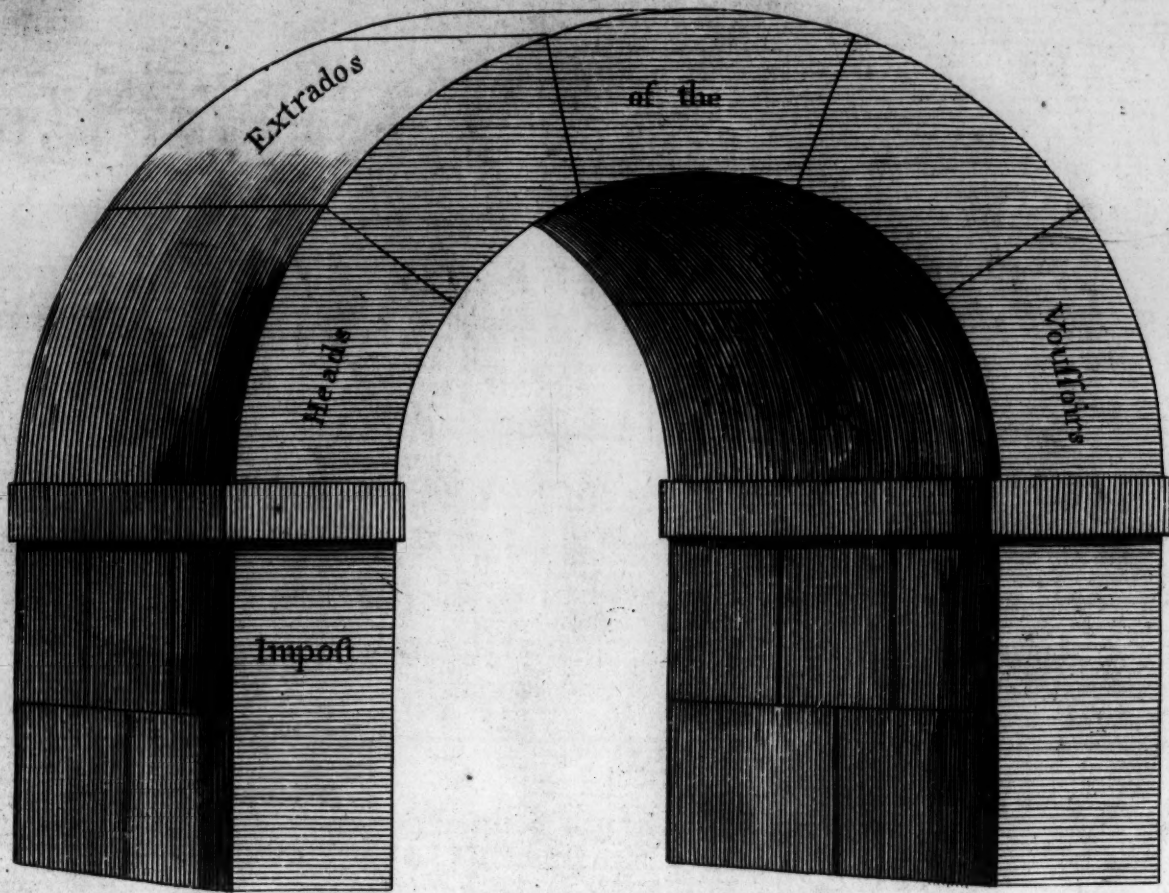


Fig. 3.

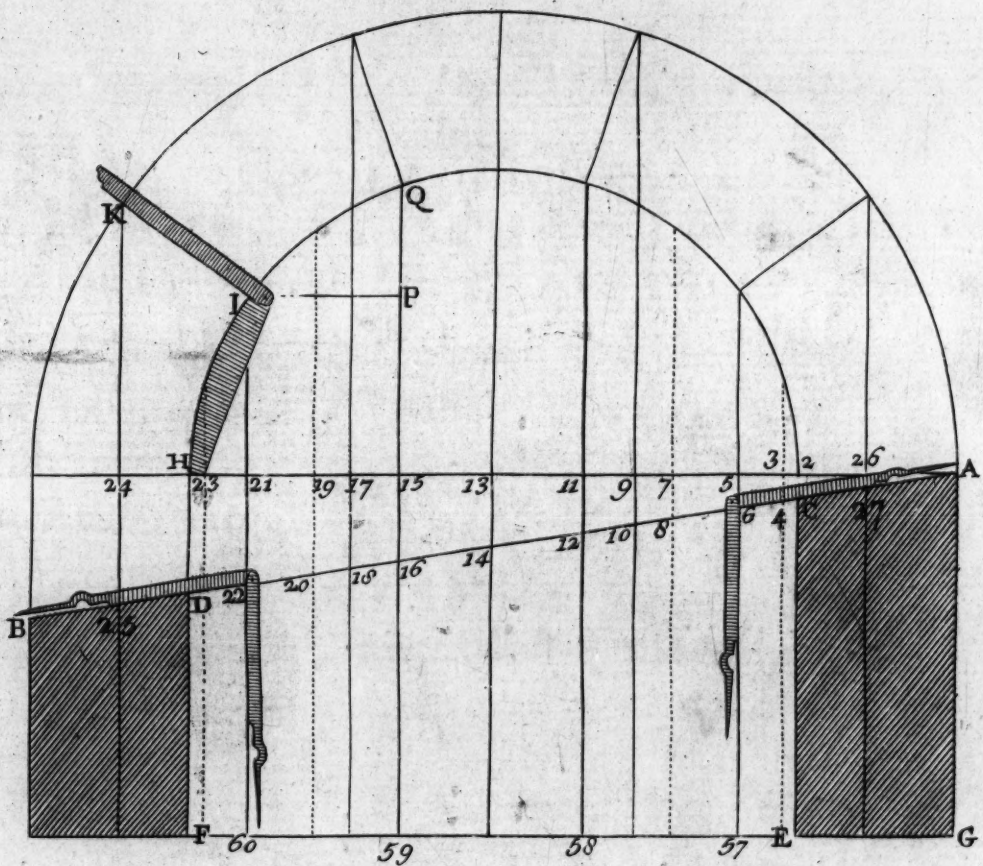
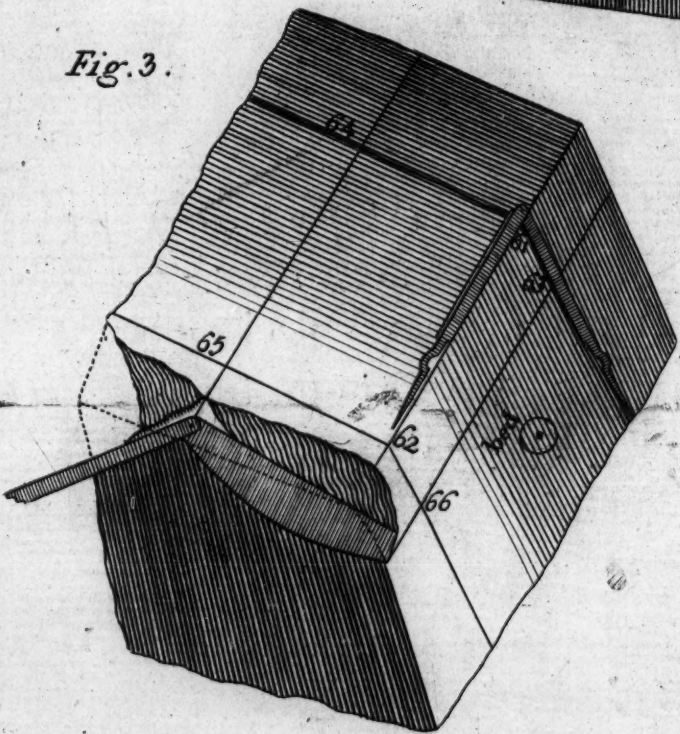
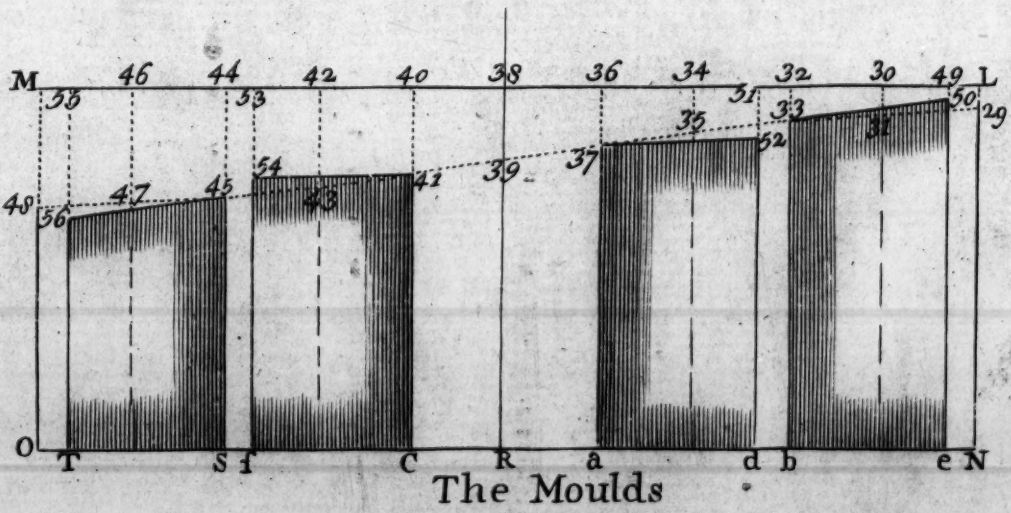
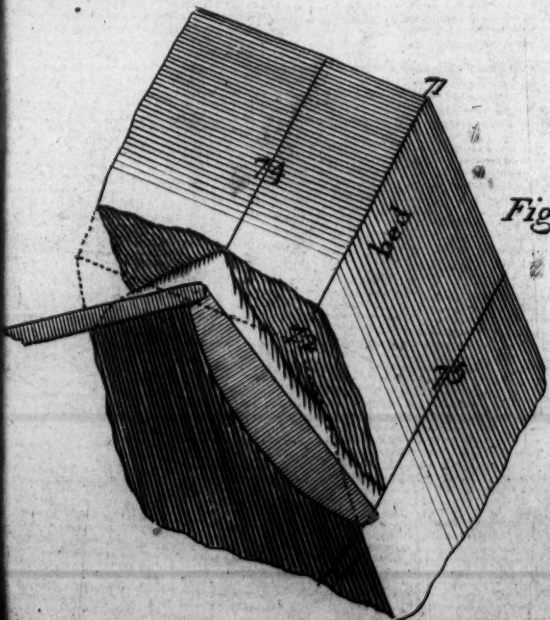


Fig. 4.



To distinguish the upper Bed or Joint, from the
under, this Mark $\odot$ is placed on the under Bed,
and this Mark $\otimes$ on the upper Bed.

Fig. 1.

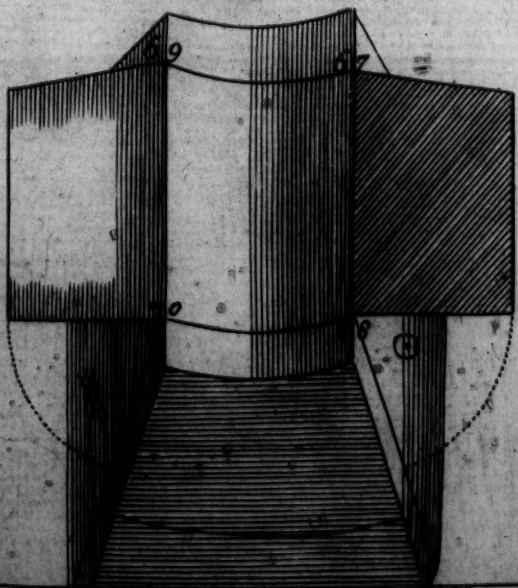
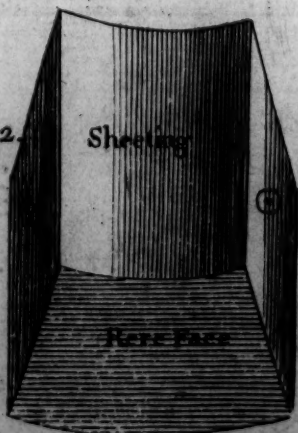


Fig. 2.





the Vouffoir will be compleated, as in Fig. 2. The other Vouffoirs are traced in the same Manner.

To trace the Vouffoirs by the Square.

Dress the Bed of a Stone, and square it on one Side, as in Fig. 3. then with a Bevel take the Obliquity 60-22 B, which apply to the Stone, placing one Leg of the Bevel along the Arras 61-62, and tracing on the under Bed, by the other Leg, the Line 61-63; then take the Length 22-60, lay this on the Arras from 61 to 62; which done square the two Lines 61-64, 62-65; then take the Chute of the Vouffoir H 21 and lay it on the under Bed from 61 to 63, and from 61 to 66 parallel to 61-62; take also the Perpendicular of the Chute 21 I, with which draw the Parallel 64-65; then by the Lines 61-64, 61-63 dress the Head of the Stone and by the Lines 62-65, 62-66 dress the Rear or Tail, after which hollow the Sheeting with the curved Bevel HIK, as represented in Fig. 3.

The second Stone is traced as the first, giving it the same Bevel, and instead of laying the Length 22-60 on 61-62 as in the first, lay in the second, the Interval 16-59 on 71-72, take the Chute IP, by which trace the Line 75 parallel to 71-72. Then take the Height of the Chute PQ, and with it, parallel to the same Arras 71-72, trace the Line 74. Hollow the Sheeting, and cut the Joints, by the curved Bevel; because in the second and third Stones, &c. The Beds and Side of the Stone only serve to find the two Arrases of the Sheeting 74, 75 as is shewn in Fig. 4. therefore in tracing by the Square, great Care must be taken in cutting these Stones, that the Joints cross the Grain of them as little as possible, or the Vouffoirs when closed by the Key-stone and pressing against each other, will cause the Arrases to chip and fly off, which has defaced many fine pieces of Work.

The two Stones on the other Side are traced after the same Manner only the Bevel is on the contrary Side, as 57-6-27 shews, and for the lengths, take 6-57 and 12-58.

To form the Key-stone; dress one Side of a Stone for the Sheeting, on which apply the Mould 12-16-58-59, then cut the Head and Tail, square to this Side, observing on the bevel Side to keep the Square, square to the Line 2-16: hollow the Sheeting, and cut the Joints by the curved Bevel, as before.

CHAPTER VI.

A Gate with a semi-circular Arch, bevelled in front; in a battering, or sloping Wall. Plate 6.

THIS Gate differing from the last, only by the addition of the Batter, that will be particularly treated of here, without repeating the former Work.

Make a TRACE as in the preceding; continue the Line A B to C; from the Point B, draw the Line of the Batter B D: From the middle of the Sheetings, from the Chutes, and from the Joints, draw Lines parallel to E B, as 39-10, 40-8, 41-6, 42-4, 43-D, &c. all which are terminated by the Line of the Batter B D.

Method of laying the Retreat of the Batter on the Bevel.

Take the Interval 1-2 and lay it square to the Line of the Bevel, below it on one Side on 15-16, and on the other on 31-32: lay 3-4 on 17-8 and 29-30, 5-6 on 19-20 and on 27-28, 7-8 on 21-22 and on 25-26, and 9-10 on the middle 23-24; then trace by Hand the dotted Curve G 24 H. To find that of the Extrados, lay the Interval 11-12 on 13-14 and on 37-38, lay also C D on 33-34 and on 35-36, &c. then trace the Curve E 36 F and draw the Lines 18-14, 22-34, 26-36 and 30-38 which represent the Joints in Plan.

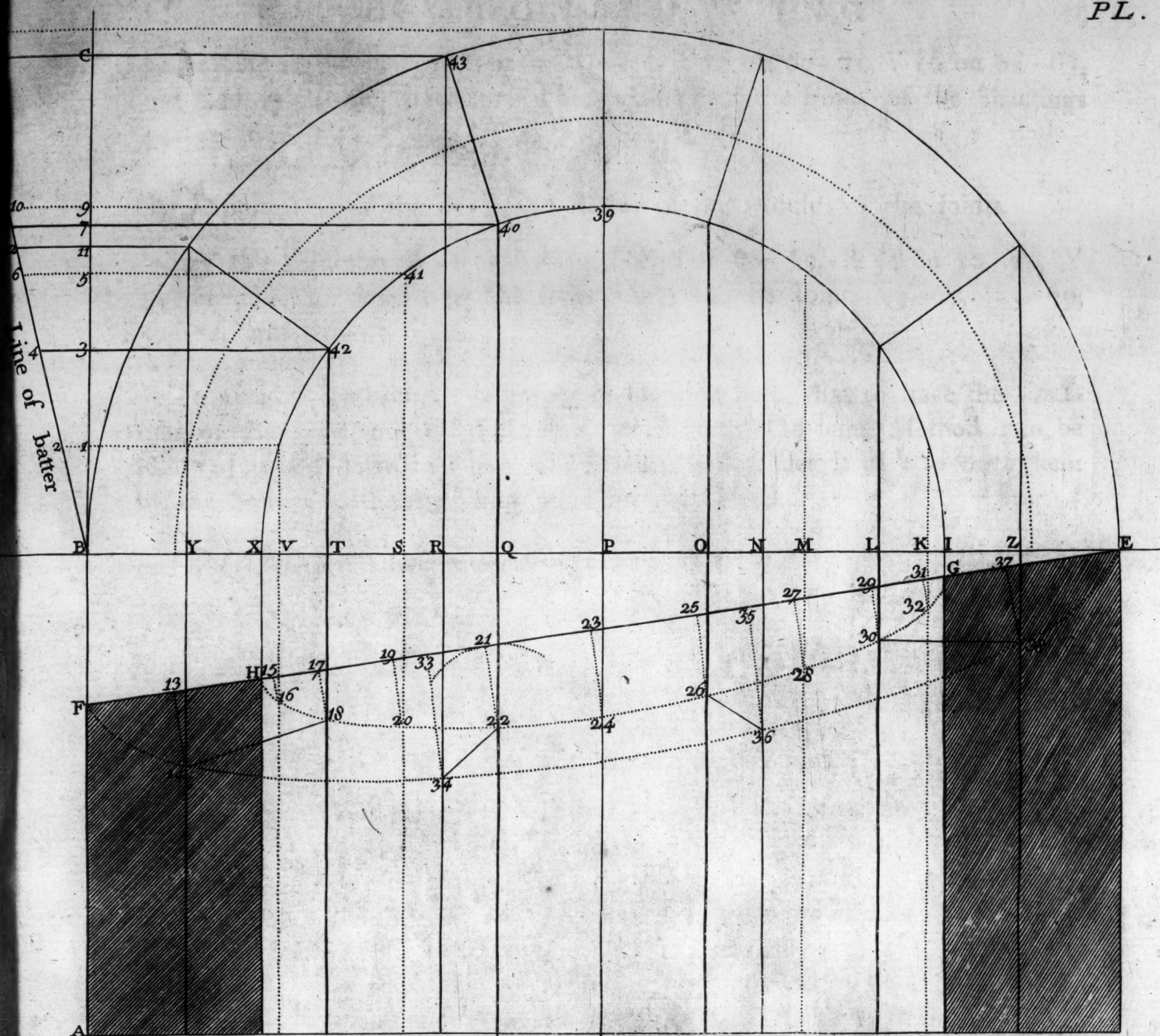
But the better to understand the Method of laying the Retreat of the Batter square to the bevelled, or oblique Front, we shall here give an Example which shall serve for all.

Having taken the Interval 7-8 (or any other) with the Compasses, place one Point of the Compasses on 22, so that with the other Point describing an Arc, the front Line may be a Tangent to it, as in Point 21; then will the Line 21-22 be square to the Line E F, for if the point of the Compass had been placed a little above or below 22, the other Point, either would not touch the Line E F, or would have intersected it.

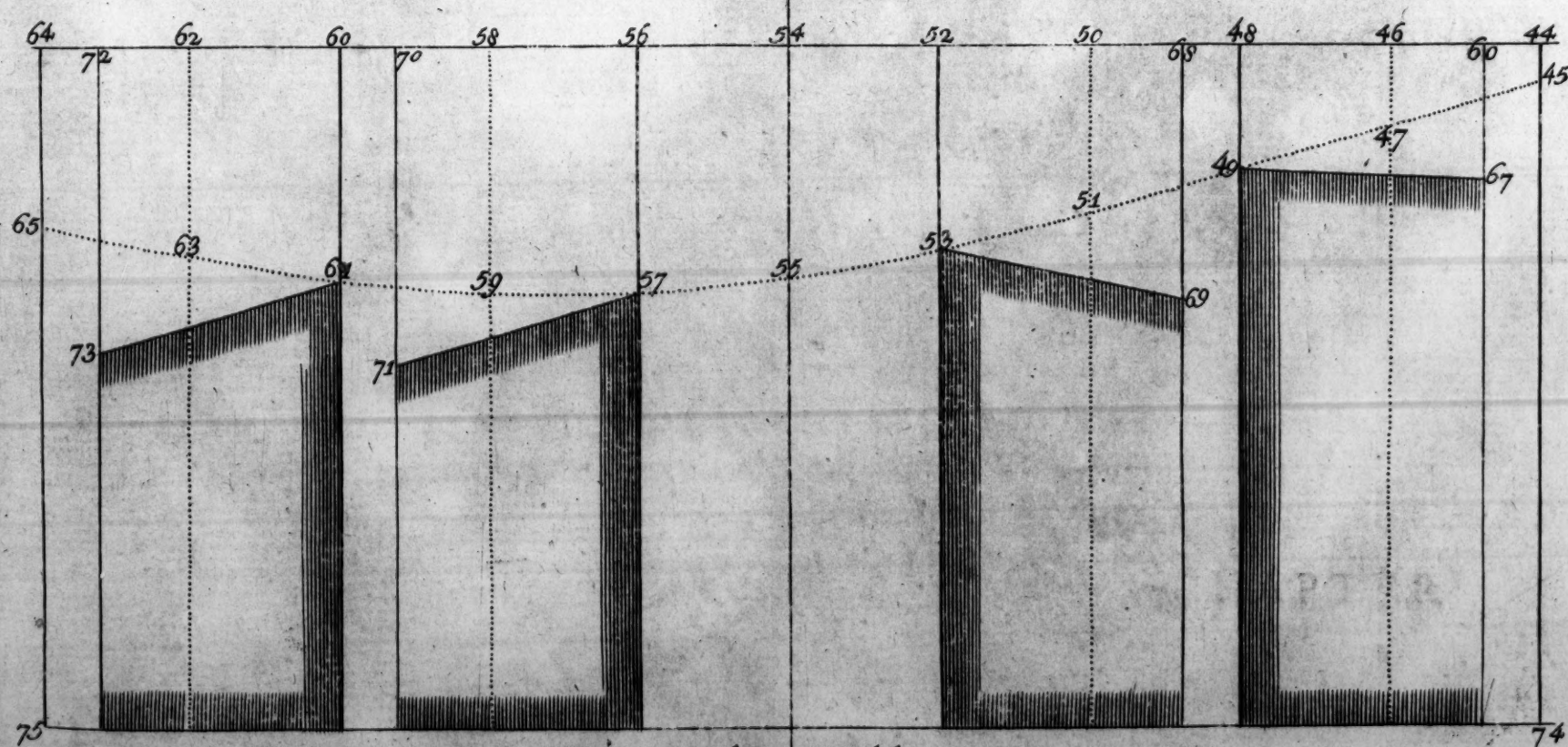
Application of the Bevel and Batter to the Moulds of the Sheetings.

Having as before drawn the two Parallels 44-64, 74-75 distant from each other A B, and marked on them the Lines of the Sheetings, the middle of the Sheeting, and those of the Joints; lay the Distances I G on 44-45, K 32 on 46-47, L 30 on 48-49, M 28 on 50-51, O 26 on 52-53, P 24 on

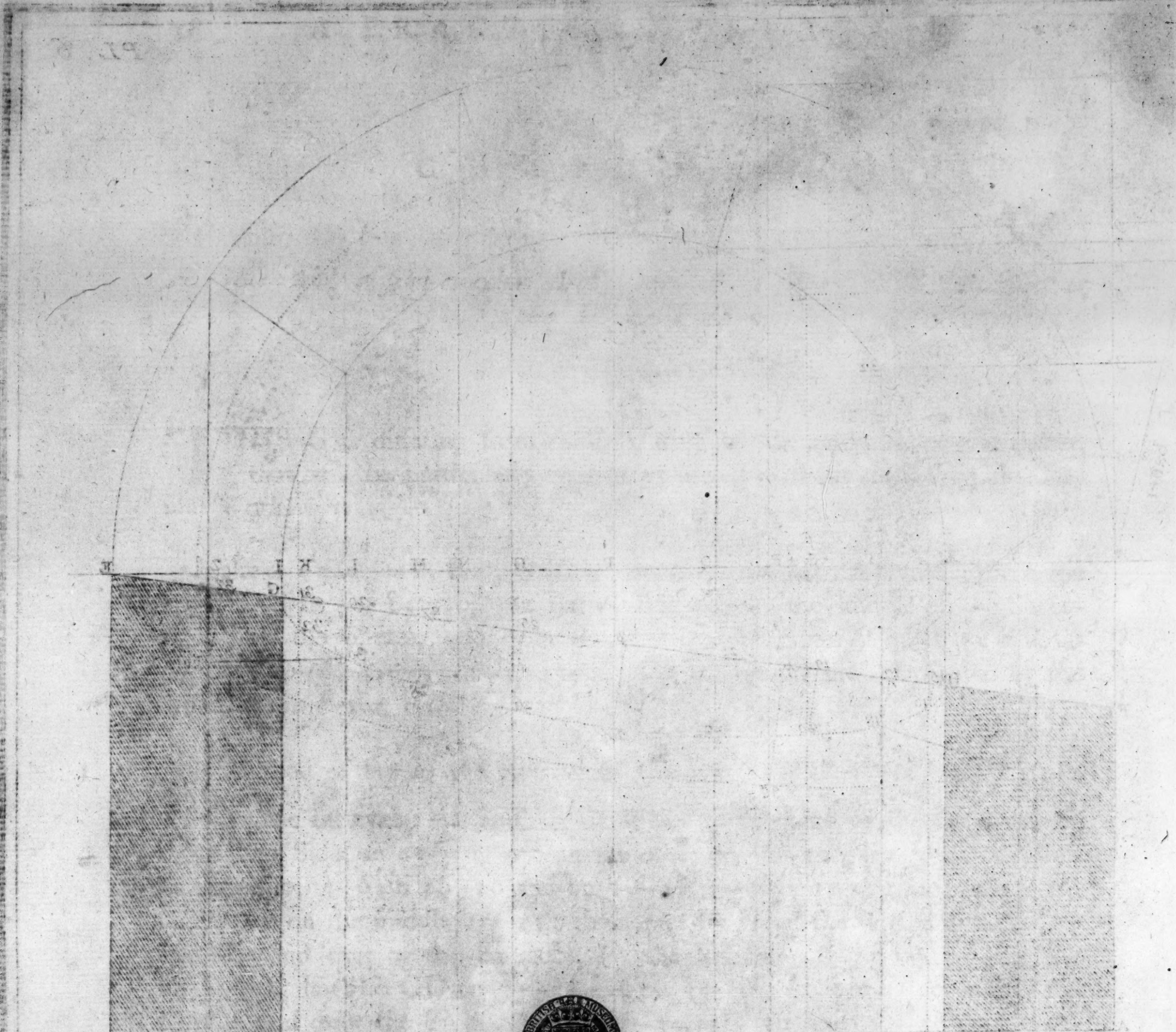
54--55



A Gate with a semicircular Arch bevel'd in front and the Wall batter'd

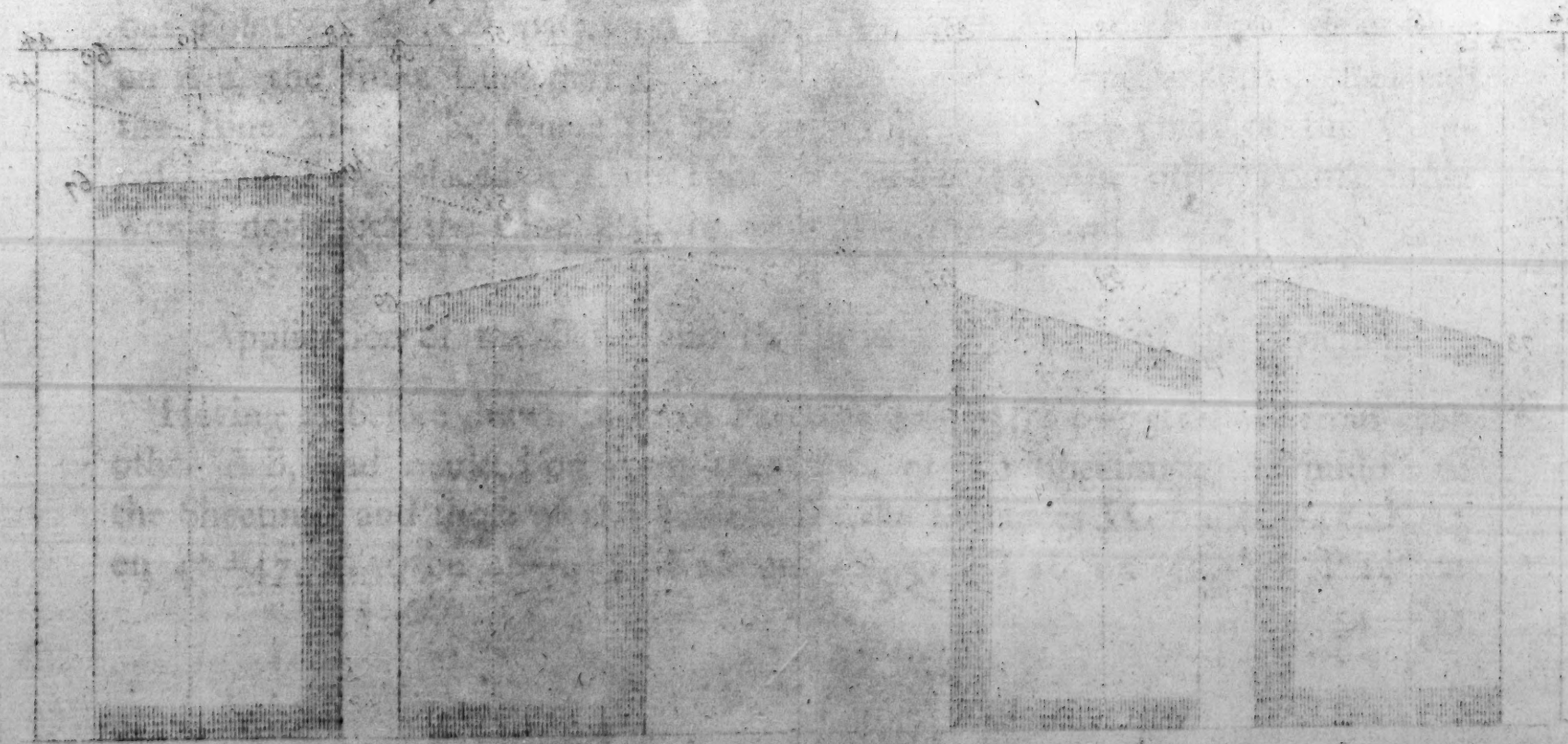


The Moulds



From the Wall pattern

A Gate wall pattern



double

54-55, Q 22 on 56-57, S 20 on 58-59, T 18 on 60-61, V 16 on 62-63, and XH on 64-65, trace the dotted Curve of the Front of the Sheetings 45-55-65.

Application of the Bevel and Batter of the Moulds of the Joints.

Lay the Distances Z 38 on 66-67, N 36 on 68-69, R 34 on 70-71, Y 14 on 72-73, then draw the front Lines of the Joints 49-67, 53-69, 57-71, and 61-73.

To avoid Repetition, it is proper to mention here, that to trace the Voussoirs of this Gate and the following, by Moulds, the same Method is to be followed as laid down in Chap. 5. Practice will render it easy to trace them by the Square, without adding more on that Head.

CHAPTER VII.

A Gate with a semi-circular Arch, bevelled in front, in a battering Wall; butting or intersecting a semicircular Arch. Plate 7.

THIS Gate is said to butt a semi-circular Arch, because it crosses or intersects the Reins of a straight semi-circular Vault, with which it forms a LUNETTE.

The TRACE being the same as the preceding, we shall only add what concerns the Intersection of the Vault.

Continue the Line AB to C; prolong the Line BD towards E, on which describe the Arch of the straight semi-circular Vault BF; draw the dotted Lines of the middle of the Joints, which produce beyond the Rear-line AG, as also the Chutes, their Perpendiculars, &c. as in the Plate. Then from the Chutes, their Middles, and from the Joints, draw Lines parallel to BD, until they cut the semi-circular Arch, as L 15, K 7, O 11, I 3, and H 1, &c. then working for the butting of the Arch, as for the Batter, lay the projections 1-2 on 17-18 and on 19-20, 3-4 on 21-22 and 23-24, 5-6 on 25-26 and on 27-28, 7-8 on 29-30 and on 31-32, 9-10 on 33-34 and trace the Curve 43-34-20, which is the Plan of the Intersection of the two Arches. For the Extrados lay 11-12 on 35-36 and on 37-38, CF on 39-40 and on 41-42, &c. through these Points trace the Curve A 40--38 G, and the Plan of the Joints 30--48--40, 32--50--42, 22--44--36 and 24--46--38.

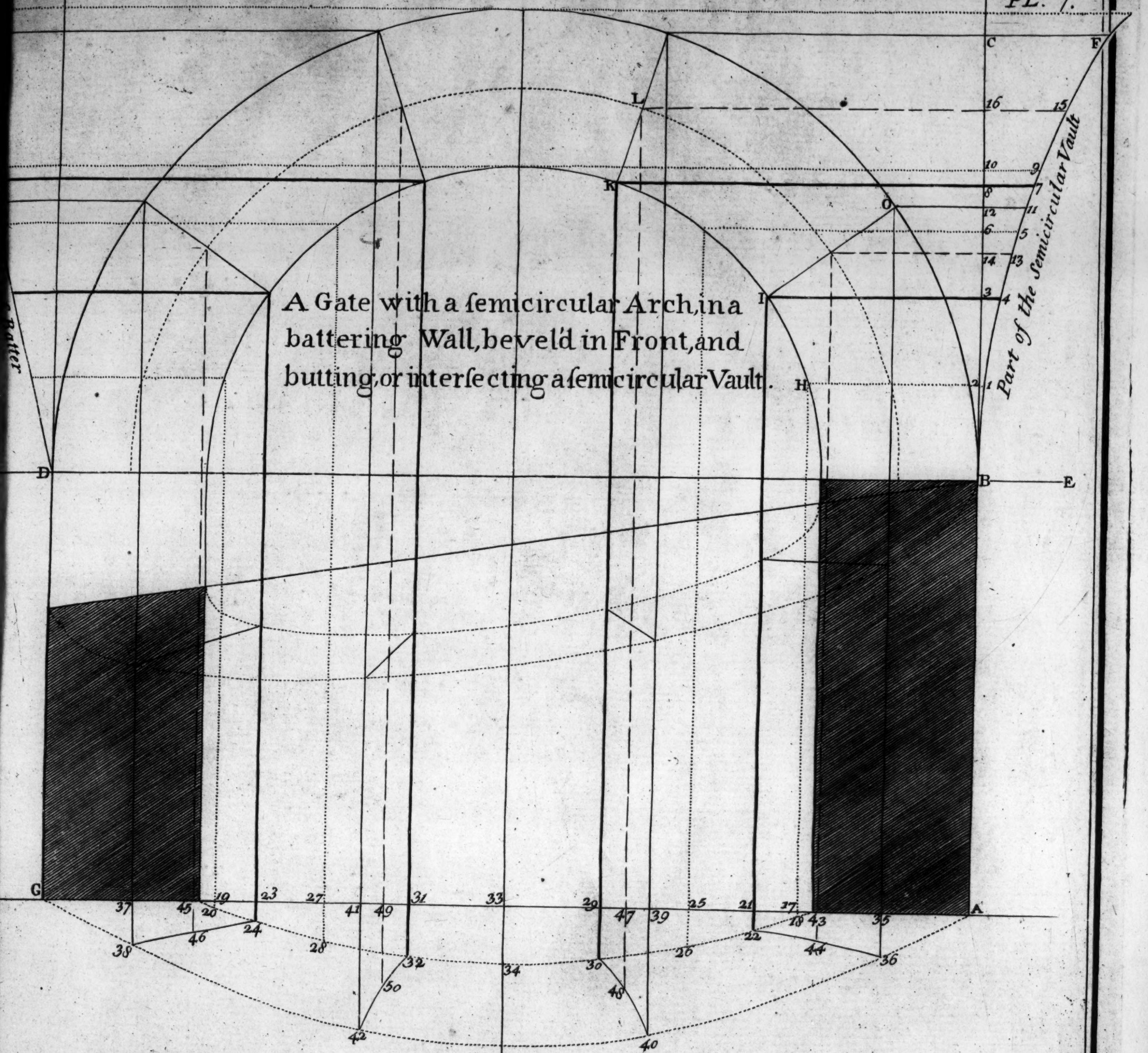
To lay the Projection of the intersected Arch, on the Mould of the Sheeting.

Lay 17--18 on 51--52 and 53--54, 21--22 on 55--56 and on 57--58, 25--26 on 59--60 and on 61--62, 29--30 on 63--64 and on 65--66, 33--34 on 67--68 and trace the rear Curve of the Sheeting M 56--68--58N.

To lay the Projection of the intersected Arch, on the Moulds of the Joints.

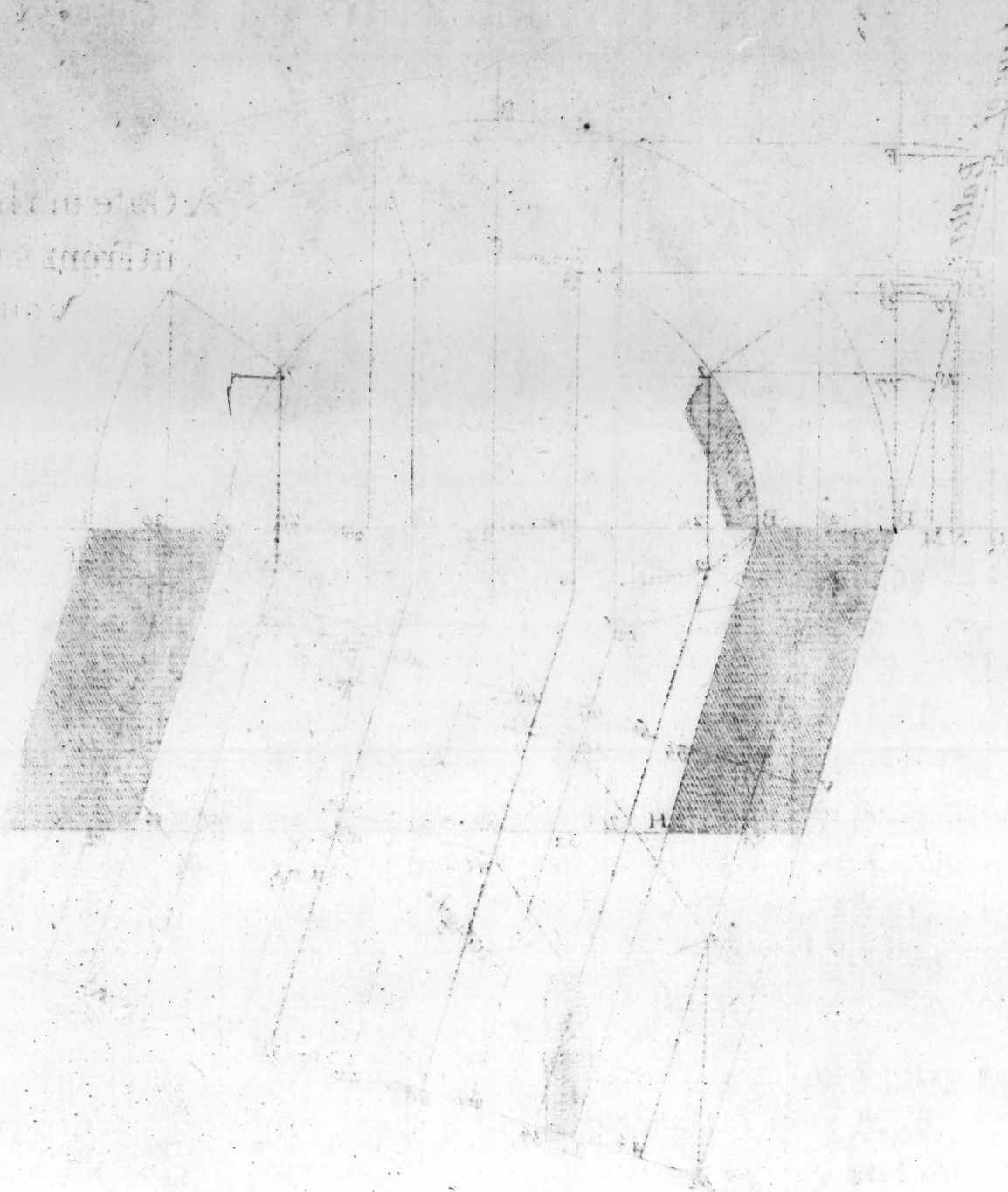
Lay 43--44 on 77--78 and on 79--80, 35--36 on 69--70 and on 71--72, 47--48 on 81--82 and on 83--84: then lay 39--40 on 73--74 and on 75--76, and trace the curved Rear of the Moulds of the Joints 56--78--70, 58--80--72, 64--82--74, and 66--84--76.

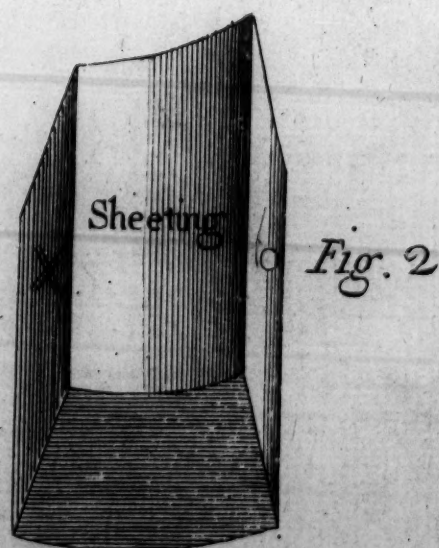
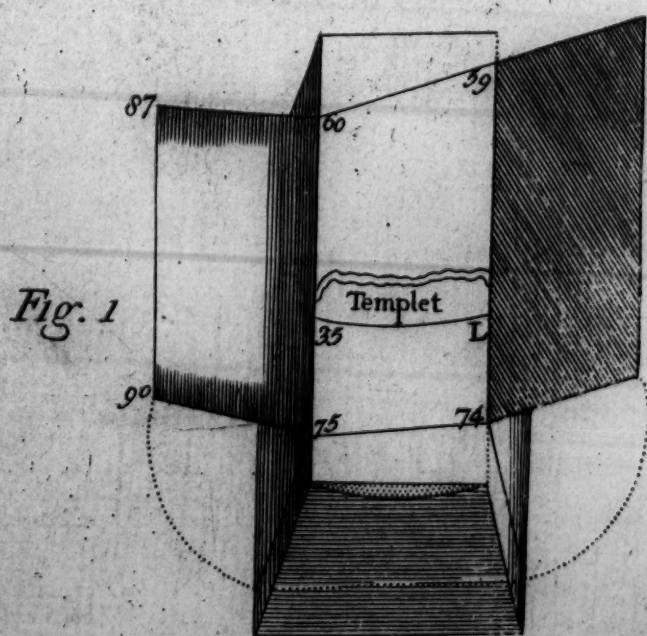
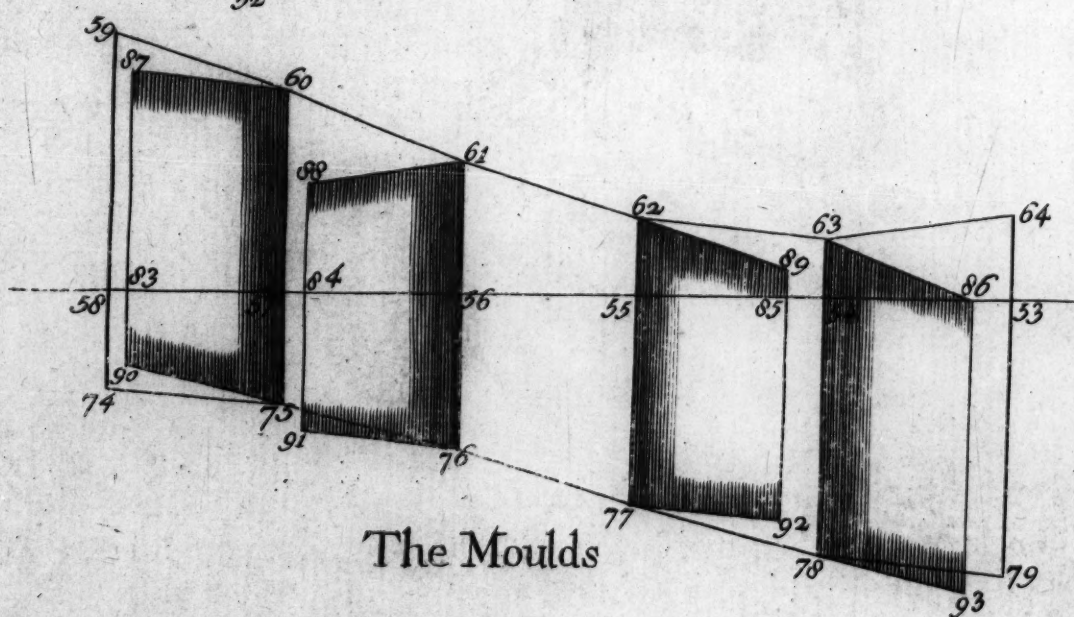
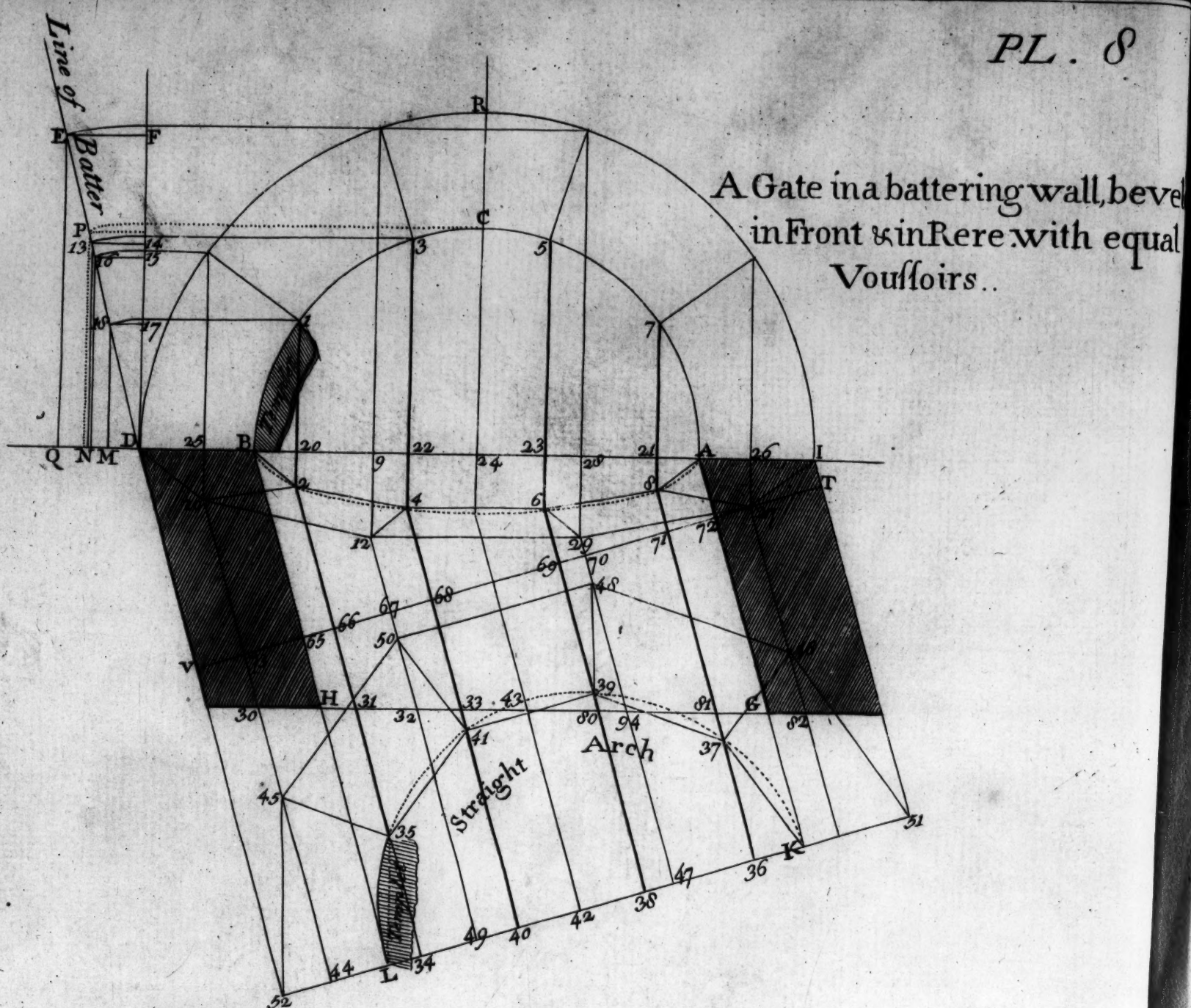
Pratter

[illegible]



At the battering wall, beve
in front of the wall with equal
conduits





CHAPTER VIII.

A Gate in a battering Wall, bevelled and battered in Front, and in Rear, with Voussoirs of equal Heads. Pl. 8.

LET ABGH be the Plan of the Imposts, from the Point 24 as Center, describe the Arcs ACB, and IRD, which divide into five (or more) equal Parts: Draw the joint Lines from the Center, as usual; draw the Perpendiculars from the Joints, below AB: from the Summits of the Perpendiculars draw Lines parallel to AB, terminated by the Perpendicular DF, from whence they are continued to the Line of the Batter DE, by portions of Circles of which D is the Center, and from the Points where these Circles cut the Batter, as from E, 13, 16, 18, &c. draw the Lines 18-17, 16-15, 13-14, EF, &c. parallel to AB, which Lines are to be laid on the Perpendiculars of the Sheetings and Joints, below the Line AB, in the following Manner.

Lay the Distances 17-18, from 26 to 2, and from 21 to 8; lay 13-14, on 22-4 and on 23-6; through these Points trace the Curve A, 8, 6, 4, 2, B; to find the Extrados or outer Curve, lay 15-16 on 25-10 and on 26-27, EF on 9-12 and on 28-29 and draw the Lines 127, 27-29, 29-12, &c. and also the Joints 2-10, 4-12, 6-29, 8-27; prolong at pleasure the Lines of the Plan AG, BH to K and L and draw the Lines 8-36, 4-40, 2-34, &c. parallel to AG and BH.

To make the Arch straight draw at pleasure the Line 51-52 square to the Side of the Plan AG, BH, above which on the bevelled Lines proceeding from the Perpendiculars of the Sheeting, lay the Heights of the Perpendiculars let fall from the Line of Batter; each on its respective Line, which terminates the said Perpendiculars, for Example, lay M 18, (which proceeds from 1 and from 7) on 34-35 and 36-37, (which are drawn from the same Points 1 and 7), lay N 13 on 38-39 and on 40-41, NP on 42-43 and trace the dotted Curve K 43 L; to find the Extrados, lay N 16 on 44-45 and on K 46, QE on 47-48, and on 49-50, then draw the Lines 51-46, 46-48, 48-50, &c. and draw at pleasure the Line TV square to D 52.

To form the Moulds of the Sheeting.

Draw the Line 53-58 at pleasure, on which lay the Breadths of the Sheetings (not from the Arch ACB as before) but those of the straight Arch K 43 L, that is, lay the Distances K 37 on 53-54, 37-39 on 54-55, 39-41 on 55-56, 41-35 on 56-57 and 35 L on 57-48; through the Points 53-54-55-56-57-58 draw the Lines 53-79, 54-78, 55-77, 56-76, 60-75 and 59-74 Perpendiculars to 53-58: to terminate the Front of the

the Sheeting lay 72 A on 53-64, 71-8 on 54-63, 69-6 on 55-62, 68-4 on 56-61, 66-2 on 57-60, lastly 65 B on 58-59: then draw the front of the Sheeting 59-60, 60-61, 61-62, &c. To find the rear Lines of the Sheeting, lay the Distances 72 G on 53-79, 71-81 on 54-78, 69-80 on 55-77, 68-33 on 56-76, 66-31 on 57-75 and 65 H on 58-74; and draw the rear Lines of the Sheeting 74-75, 75-76, 76-77, &c.

To form the Moulds of the Joint.

Lay the Heights of the Joints of the straight Arch, 37-46 on 54-86, 39-48 on 55-85, 41-50 on 56-84, and 35-45 on 57-83; then thro' the Points 83-84-85-86, draw the Lines of the Joints 86-93, 85-92, &c. parallel to those of the Sheeting. To terminate the Fronts of the Joints lay the Distances 73-10 on 83-87, 67-12 on 84-88, 70-29 on 85-89, and the Point 27 falling accidentally on the Line T V, will be distinguished in the Moulds by the Point 86, the Intersection of the Lines 53-58 and 93-86, then draw the front Line of the Joints 63-86, 62-89, 61-88, and 60-87; to find the rear Line of the Joints, lay the Distances 73-30, on 83-90, 67-32 on 84-91, 70-94 on 85-92, 27-82 on 86-93, and draw the Lines 78-93, 77-92, 76-91, and 75-90.

It must be observed that the Vouffoirs of this Gate, must be cut by the Moulds of the Heads of the straight Arch, and the Moulds of the Sheeting must be applied on the Vouffoirs before the Sheeting is hollowed; as we shall shew in the first Figure.

Let the first Vouffoir on the right Hand be cut by the head Mould 52 L 34-35. On the Face of the Stone intended for the Sheeting, apply the first Sheeting Mould 60-75-74-59: on its upper Bed, the first joint Mould 60-75-90-87; and on its under Bed the Plan of the Impost D B H; then cut the two Heads according to this Trace and hollow the Sheeting square to its Arrafes 60-75-74-59, using for this purpose the curved Bevel L 35, placing the Bottom L on the under Arras of the Sheeting, as is represented in the Figure. The second Figure shews the Vouffoir finished; the rest are cut in the same Manner. We shall shew in Chap. 10. in what the straight Arch differs from the Face of a bevelled Arch, &c.



The bevel'd Arch traced by the Square.

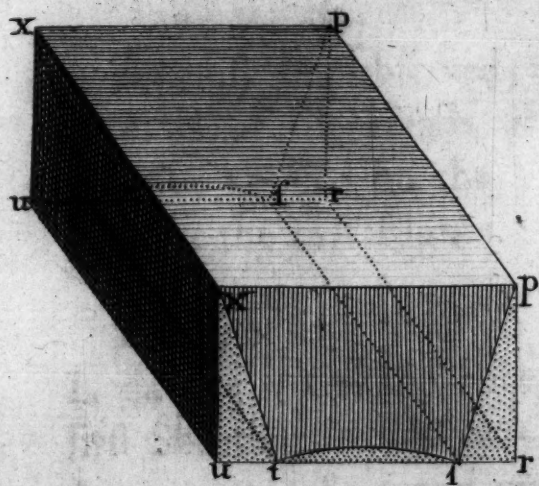
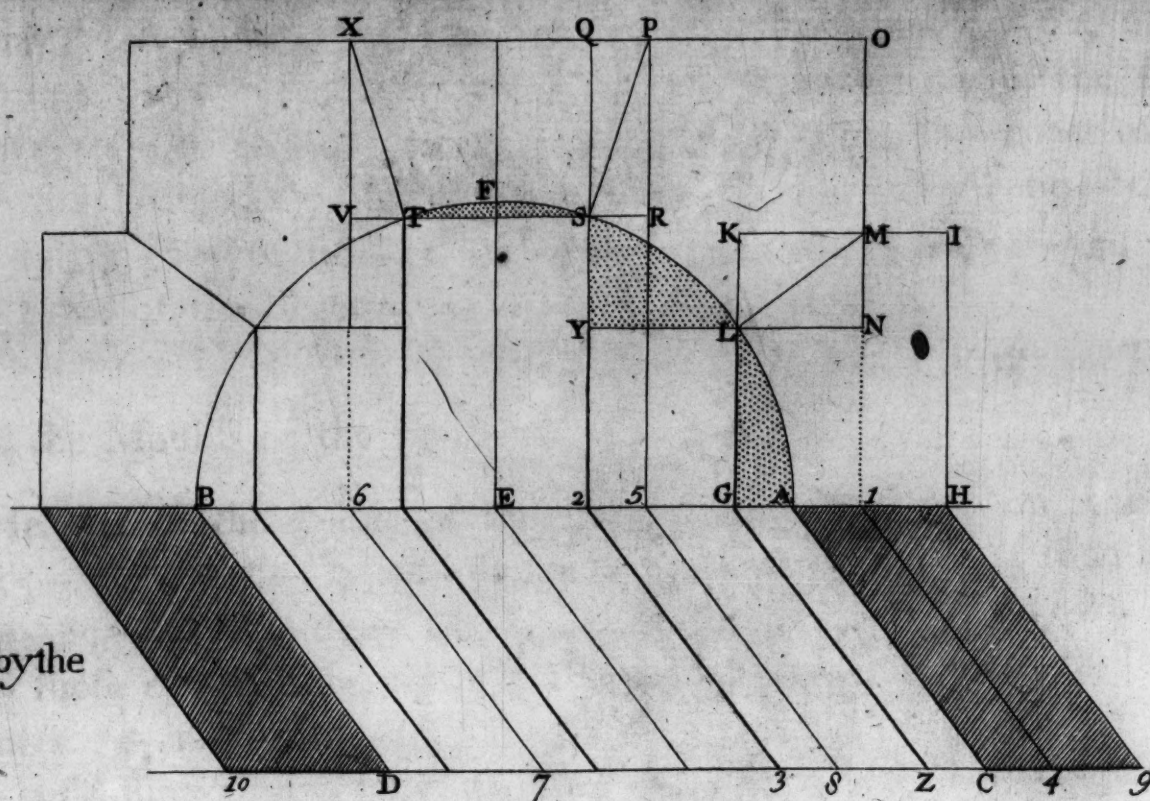


Fig. 3

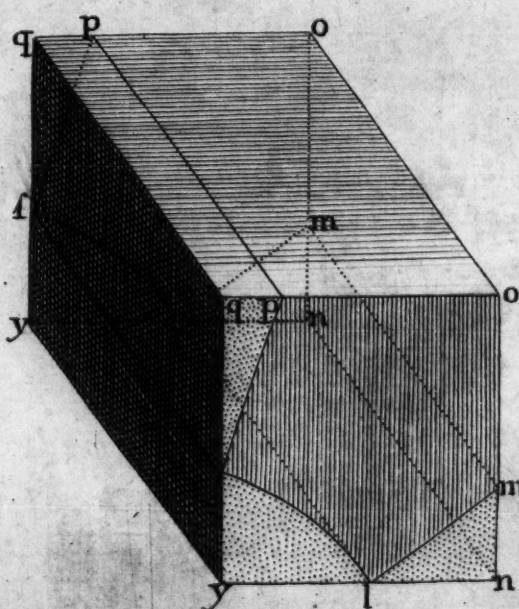


Fig. 2

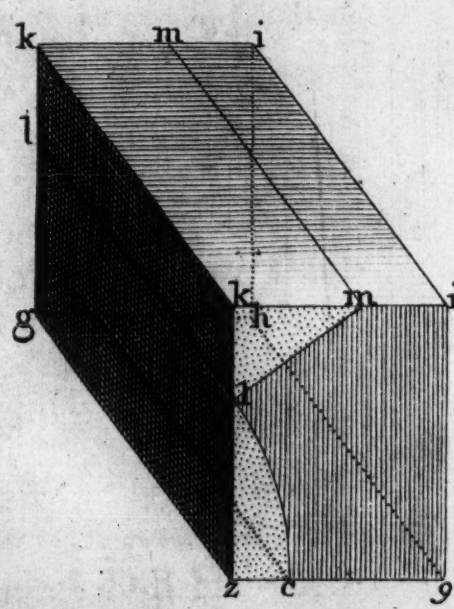


Fig. 1

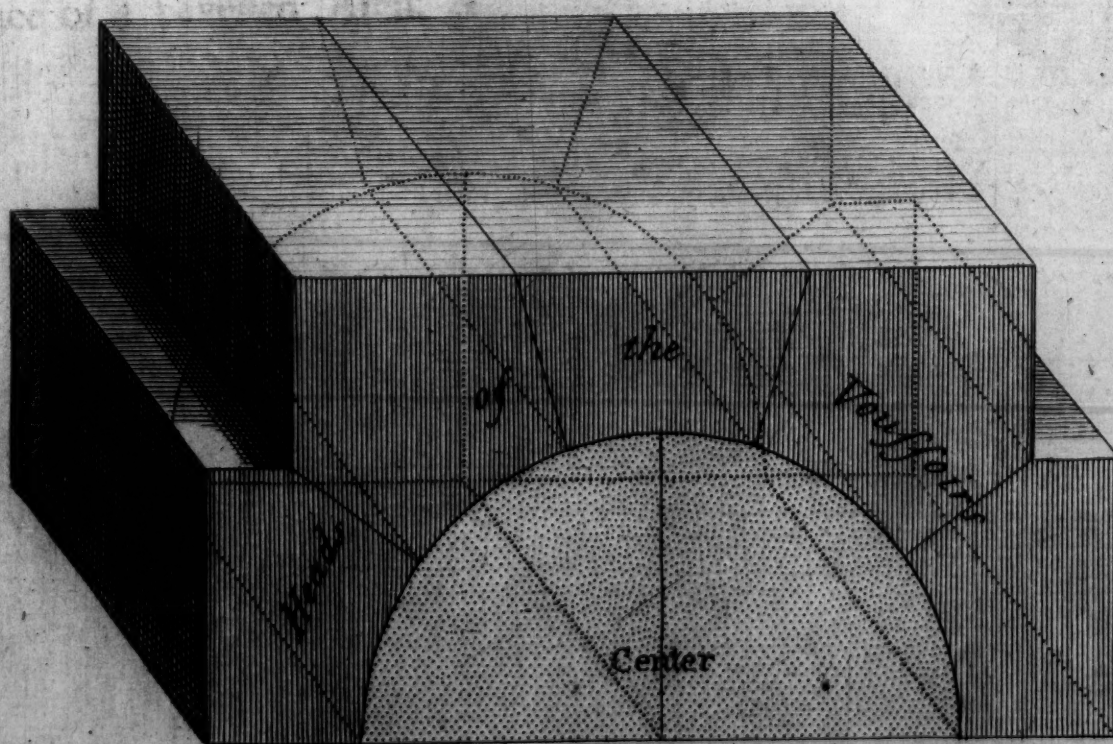


Fig. 4

CHAPTER IX.

Of the bevelled Arch, traced by the Square. Pl. 9.

LET ABCD be the Plan; from E the middle of AB, describe the Arc AFB, which divide into five equal Parts, and from the Center E draw the joint Lines; draw the Perpendiculars of the Chutes, square on AB, and where these Lines cut AB draw others parallel to the Imposts AC, BD.

To form the first Vouffoir on the Impost HAC, make a Bed to a Stone to receive the Plan of the Bevel HGZ 9, and square the other Sides to it: to the two Ends, or Heads apply the Mould GHIK, whose Height GK serves to gauge the Stone, and make the upper and under Beds parallel to each other; then take the Chute and its Perpendicular, as also the Sheeting or Curve, and the upper Joint, all which are represented in Fig. 1. and by small Letters of the Alphabet, referring to the great ones in the TRACE, then work off the dotted Part and the Stone is finished.

Having made a Bed to the second Stone, apply upon the top of it the bevelled Mould 1--2--3--4, according to which cut the other Sides square to it; then apply to the Ends or Heads the Mould YQON, whose Height YQ regulates that of the Stone; trace, as in Fig. 2. the Sheeting and Joints, as shewn by the small Letters. Then work off the dotted Part, as before, and the Stone is finished.

For the Key-stone, dress a Bed, by the Mould 5--6--7--3 as before, and to the two Ends apply the Mould PRVX, whose Height VX is that of the Stone, the Sheeting and Joints are then traced as in Fig. 3. and the surplus dotted Part worked off: the two last Stones are traced and worked in the same Manner, but when set in the Work, the Rears must be turned to the Front, as the Angle CAH of the Front of the Impost, is equal to BD 10, the rear Angle of the other Impost.

To make this still more intelligible, Fig. 4. represents the Vouffoirs placed on the Center.

CHAPTER X.

Of the bevelled Arch, by an abridged Method. Pl. 10.

THIS TRACE is said to be abridged, because by one very short Operation, the Moulds of the Sheeting and Joints are found within the Plan ABCD; which being given, divide AB into two equally in E, through which draw EF parallel to AC: from the Point A draw AG perpendicular to AC; prolong DB to G: divide AG into two equally in H, from which as Center describe the Arc AFG, which divide into Voussoirs, and draw the Joints from the Center H: draw the Perpendiculars of the Chutes parallel to EF and below CD: The Moulds of the Sheeting are comprised between the Perpendiculars of the Key, and those of the Joints are traced on the Side of the Plan, as follows.

To find the Moulds of the Sheeting.

Through the Point Q draw QN parallel to GH, to find on RS the Point N; thro' the Point K draw KL parallel to GH, to find on QT the Point M, and on RS the Point L: draw the front Line of the second Sheeting MN, and the front Line of the first IL; the Rear of this Sheeting is found by the same Operation below the Plan, as in the Plate. The Mould of the Key is formed by the two Lines RS, QT, and the front and rear Lines of the Plan AB, CD: The two Moulds of the Sheeting NMTS, and LIXV, serve to trace the two Stones on each Side, observing only, that the bottom Arrases of the Sheeting on the Side AC, become those of the Top on the Side BD; or the bottom Arras of one Side, may be the bottom on the other Side, by reversing the Mould which will have the same Effect.

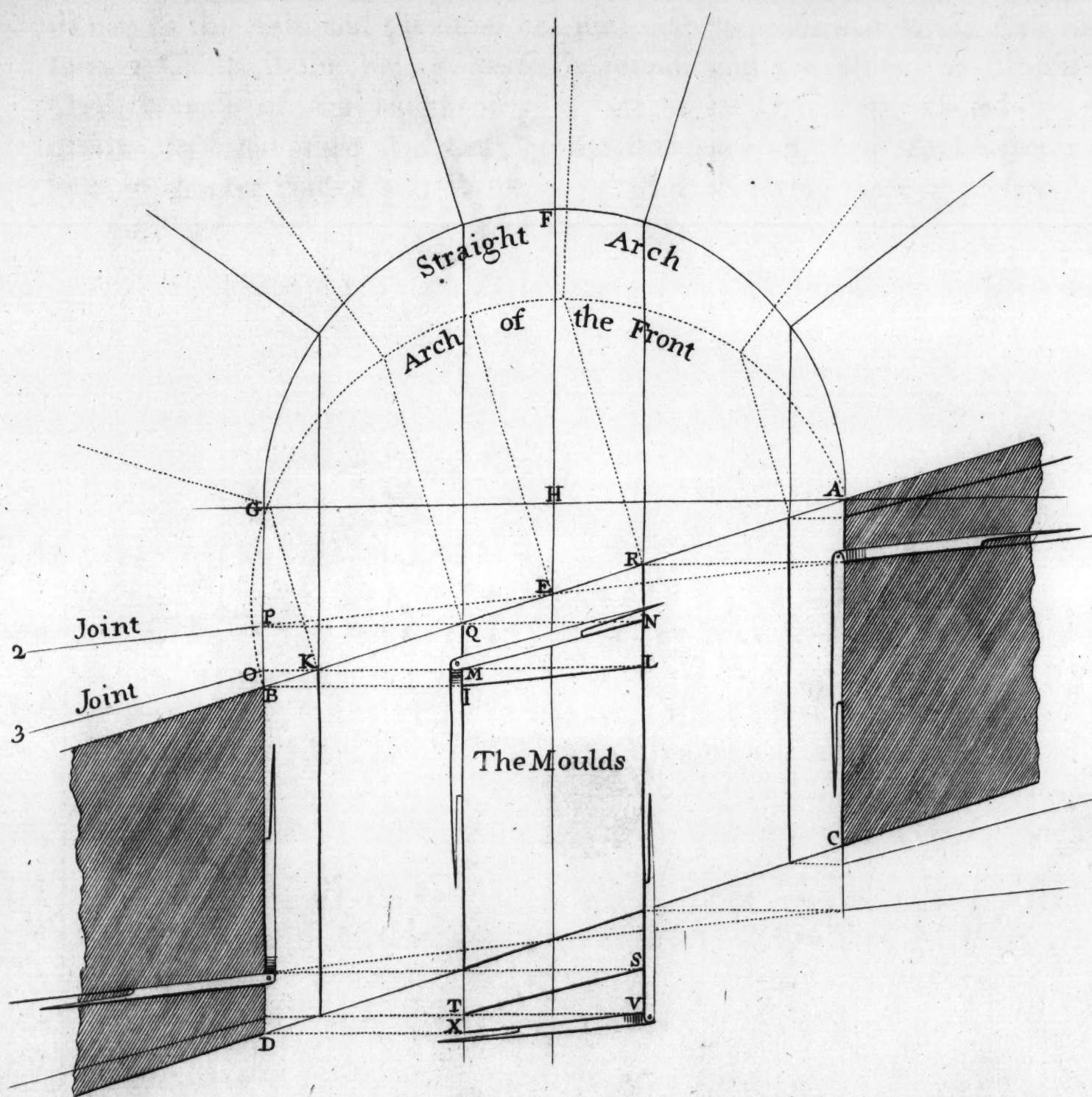
To find the Moulds of the Beds or Joints.

Prolong NQ to DG, to find the Point P, thro which and the Point E draw the Front of the second Joint P2: prolong LM on GD, to find O, through which and the Point E draw the Front of the first Joint O3: Work the same to find the Rear of these Joints, which are sufficient also to trace the Stones, by reversing them as the Sheeting Moulds before.

It is not absolutely necessary to cut out the Moulds of the Sheeting and Joints, but the Angles may be taken with the Bevel-rulers, and applied to Stones; the Heads are prepared as usual, with the Moulds of the Heads of the straight Arch.

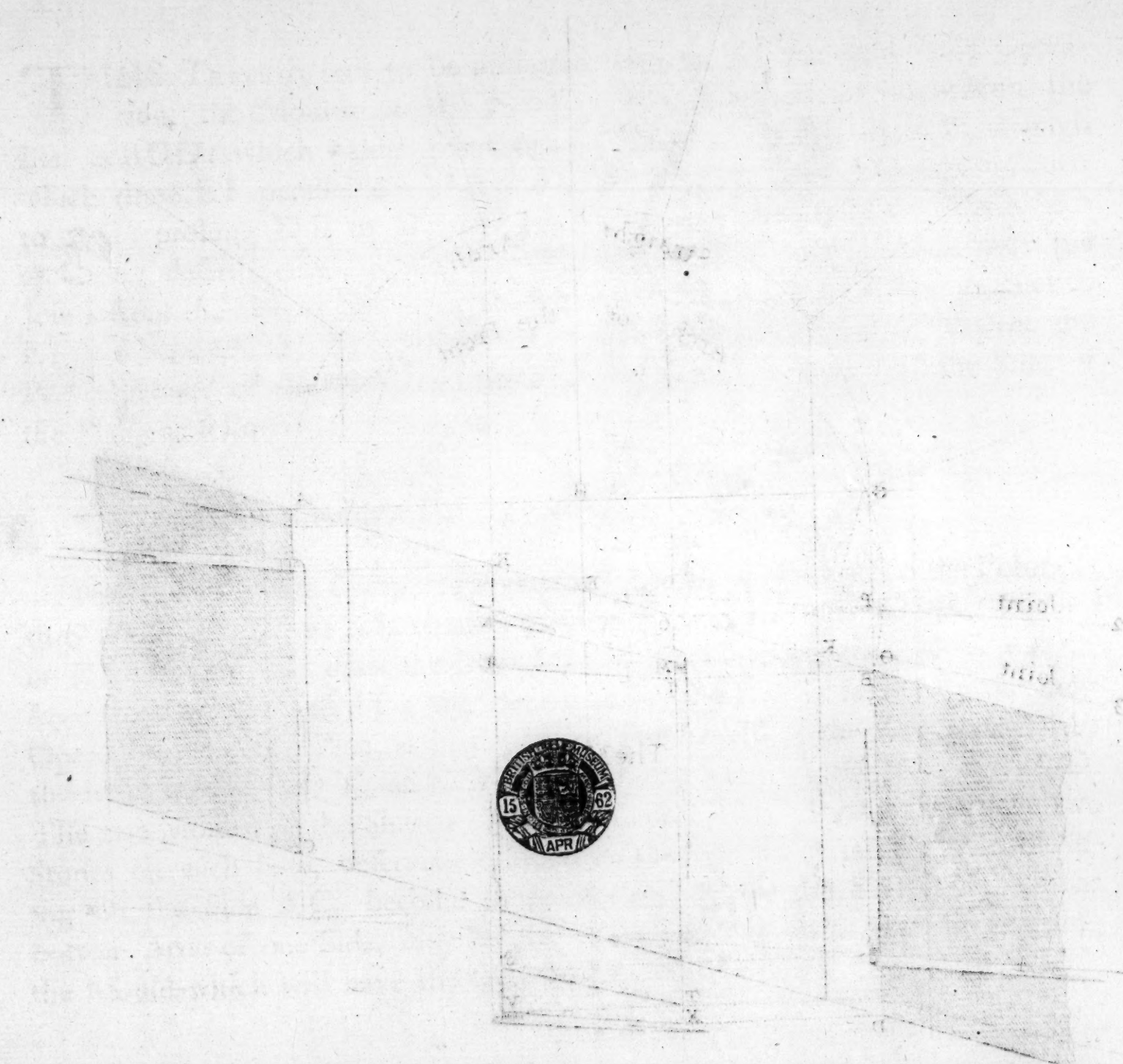
- It

The Bevel'd Arch, by an abridg'd Method



PL 10

The Bevelin and by an old method



It must be remarked in this TRACE, as well as in the preceding Bevels, that the Face or front Arch differs from a straight Arch, because the first is constructed on a Base which cuts the Plan obliquely, as A B, and on the contrary the other is constructed on a Line square to the Sides as A G; but these two Centers, whose heights are equal, having different Bases, it is evident that, that which has the greatest Base must be wider, than the other, which is a semi-circle, which is demonstrated by two Sections of a Cylinder, one perpendicular to the Axis, and the other oblique: that perpendicular to the Axis must form a Circle, if the Base be perfectly round, and the other, an Ellipsis or Oval, because of the lengthening of one of its Diameters, caused by the oblique Section; as we shall treat of the difference of these Arches more at large in another Part of this Work, we shall desist saying more at present.

CHAPTER XI.

A Gate in the Quoin of a battering Wall. Pl. II.

LET ABCD be the Plan of the Angle in which the Arch is to be constructed, of which AB is the Span: draw the Center Line 75 L, on which erect the Perpendicular EH; prolong the Line CA to E, and DB to G, then from the Point L as Center describe the Sheeting EFG, and its Extrados: divide these Arcs into five equal Parts: from the Divisions let fall the perpendiculars of the Chutes, the middles of the Sheetings and Joints, to the rear Lines of the Plan 75 C, 75 D: from the Summits of the Perpendiculars draw Lines parallel to EG, terminated by the Line of Batter HI; lay the Retreats of the Batter on the Perpendiculars of the Sheetings and Joints square to the front Lines of the Plan LA, LB, by the following Method.

Lay the Retreats 5-6 on A 21, 7-8 on 22-23 and on 34-35, 9-10 on 30-40, 11-12 on 24-25 and on 32-33, and lastly 13-14 on 26-27: then on one Side draw the Curve A 40-27 and on the other to abridge the Work, the Lines B-35, 35-33 and 33-27: for the outer Curve or Extrados, lay 19-20 on 28-29 and on 38-39, 17-18 on 30-31 and on 36-37, KI on a b: and then trace the Curve 29-31 b, and the Line b 37-39, &c.

The Moulds of the Sheeting.

Draw the Line 47-57 on which lay the Arc of the Sheeting EFG in the usual Manner: then on the Lines of the Sheetings lay the Distances, EA on 47-48, 41-21 on 49-50, 42-23 on 51-52, 43-40 on 53-54, 45-25 on 55-56 and L 27 on 57-58; then trace the front Curve of the Sheeting 48-54-58: the same must be repeated on the other Side, when there is only a straight Line drawn from one Sheeting-curve to another: To find the Rear of the Sheeting, lay EC on 47-63, 41-72 on 49-64, 42-2 on 51-65, 43-73 on 53-66, 45-4 on 55-67, L 75 on 57-68, and trace the Curve 63-65-68.

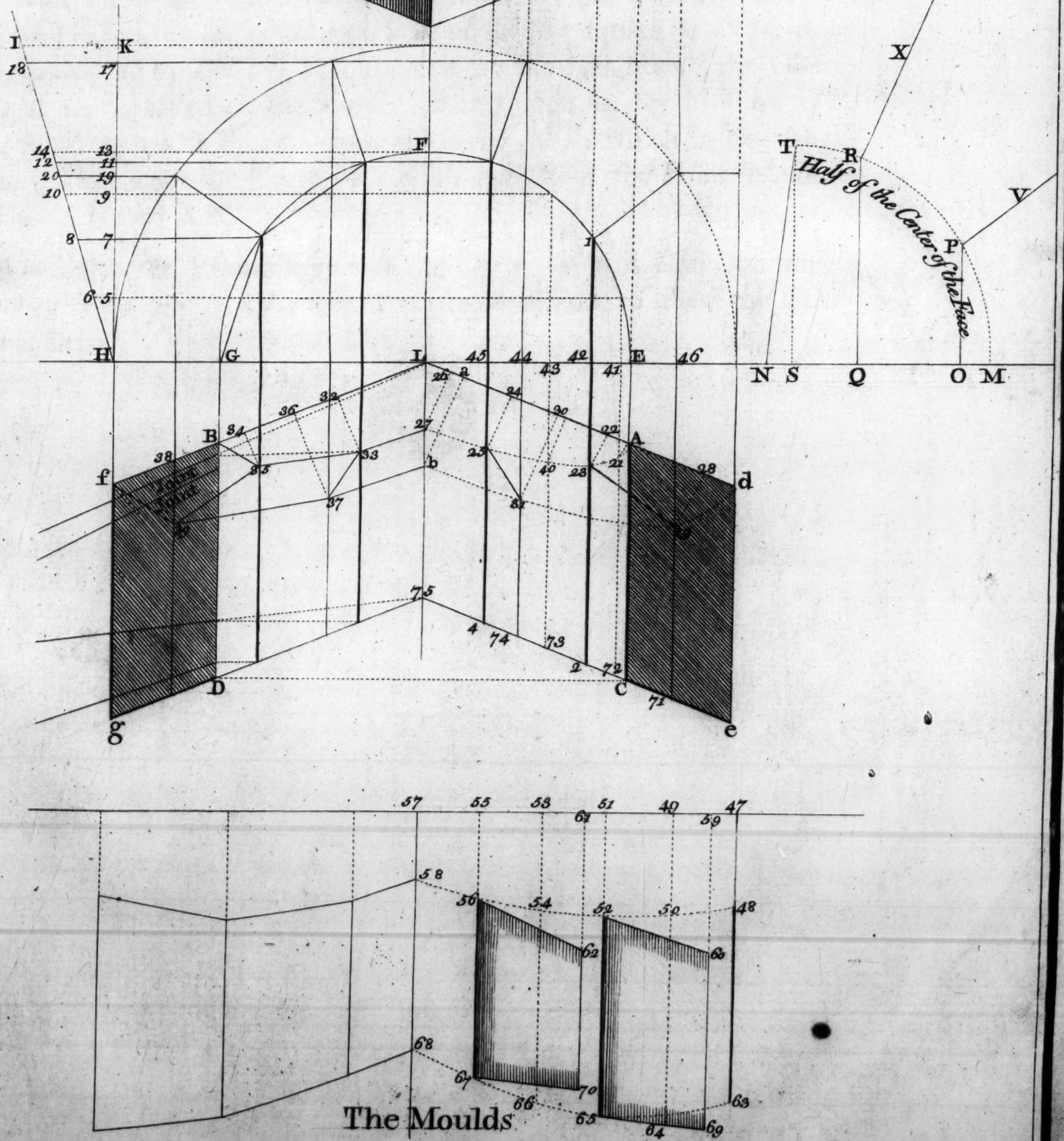
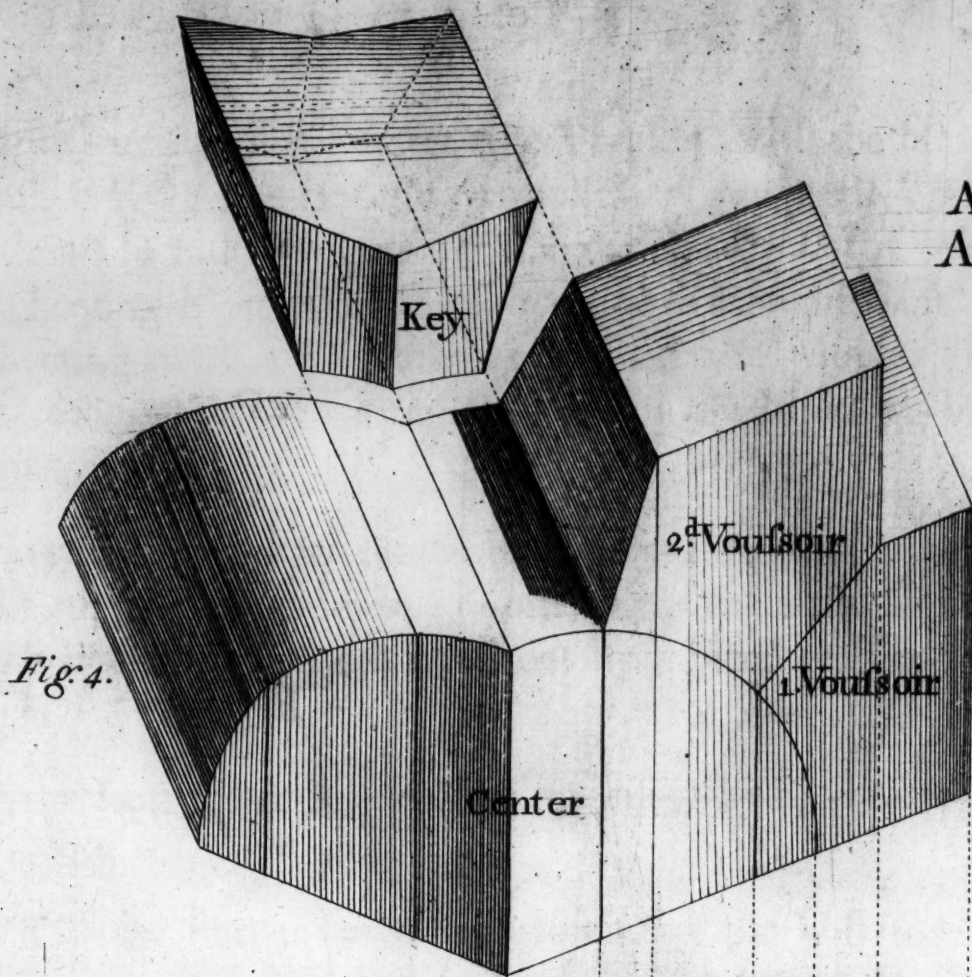
The Moulds of the Joints or Beds.

Having taken the Height of the Joint GH, with it trace the Joint-lines 60-69 and 62-70 parallel to those of the Sheetings, &c. to find the front of the Joints lay 46-29 on 59-60, 44-31 on 61-62 and draw the Lines 52-60 and 56-62; for the Rear, lay 46-71 on 59-69, 44-74 on 61-70 and draw the Lines 67-70, and 65-69.

Instead of drawing the Joints on the other Side as usual, we have made Use of the abridged Method in Chap. 10.

To

A Gate in the Quoin or
Angle of a battering Wall.



1760
The Queen's
English Battery

1760

1760

1760

1760



1760

To trace the Stones by Moulds, prepare the Vouffoirs with the Head-moulds of the straight Arch EFG; the Sheeting is hollowed and each Vouffoir, cut by its particular Mould in order: the rest is done as usual; but it must be observed that if the Sheeting Moulds used, are made with straight Lines in Front and Rear, the Sheeting must not be hollowed, untill the Moulds have been traced on the Flat, otherwise, the Moulds will be, in the Middles, too long in Front, and too short in Rear.

The Vouffoirs may be traced by the Square, preparing the Stones by the Plans ACed, BDgf, as for common Imposts: then trace the Chute and its Height; hollow the Sheeting, and cut the Joint by a Bevel or Templet made to the straight Arch.

Altho' the Arch in front be not absolutely necessary here, we shall give the Method of constructing it.

Let the Line MN be drawn apart, on which lay the Distances L 26 on NS, L 24 on NQ, L 22 on NO, and LA on NM: square to NM draw the Perpendiculars OP, QR, ST, on which lay the Heights of the Chutes of the straight Arch, taken on the Line of Batter, that is, lay H 8 on OP, H 12 on QR, H 14 on ST, and draw the Line NT, which is the Angle of the Batter; then draw the Curve MPR T, and from the Point N, draw the joint Lines PV and RX.

The Figure above the Trace represents the Center of this Gate, on which are placed two Vouffoirs; the Key-stone is placed behind to shew the Mitre of the Center better.

CHAPTER XII.

A straight Gate, with a semi-circular Arch, in a round Tower, or circular Wall by Moulds and by the Square. Pl. 12.

WE have called this an Arch in a round Tower, because it is made in a circular Wall, and seen from without; before we proceed it will be necessary to explain the Construction of this Arch, which will be readily understood by the following Operation.

Cut a Stone, as if for a Stretcher in a circular Wall, as represented in Fig. 1. on the convex Side, trace the Arc ABC and its Extrados. Divide the Arc into five equal Parts (more or less at pleasure). From the Center D draw the Joints D 1, D 2, D 3, D 4. Do the same on the inside, or concave Part of the Stone, and then round off the upper Part according to the Extrados, and the underpart must be hollowed by the Line of the Intrados ABC: draw the joint Lines within and without side, and which being cut with a fine Saw, will shew the form of the Stones, their Moulds, &c.

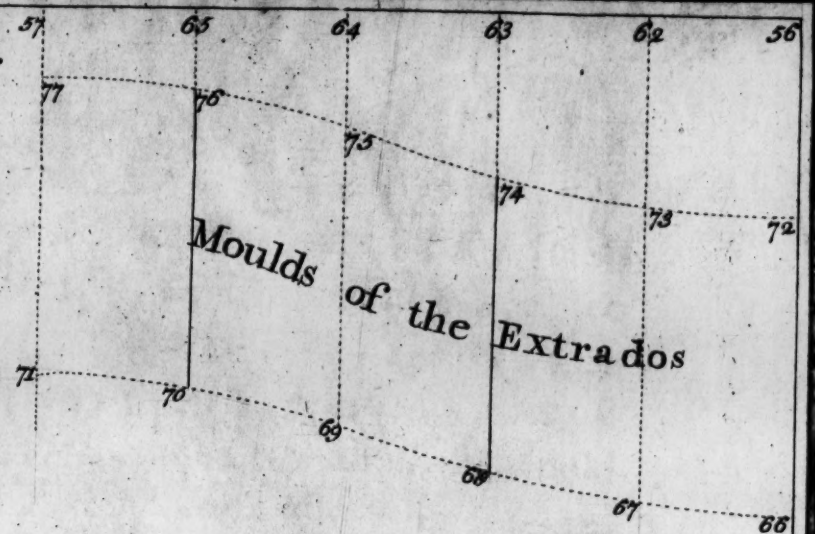
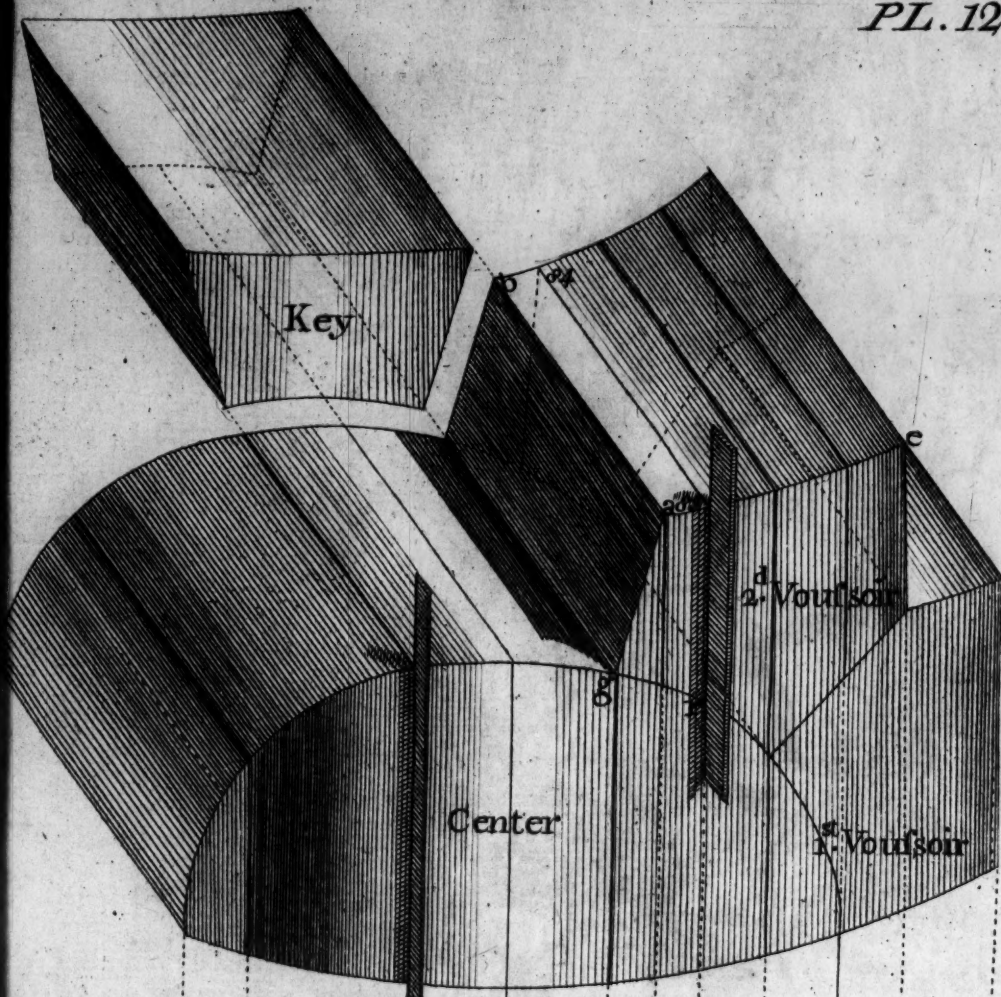
The T R A C E

Let ABCD be the Plan of the Tower; through the Point, the middle of AB, draw the Line EF parallel to AC; through the Point 7 taken at pleasure on EF, draw GH perpendicular to EF: prolong the Lines CA and DB to the Line GH to find the Points GH, thro' which from the Point 7 describe the Arc GFH; trace the Extrados: divide the Arcs into five equal Parts, and let fall the Perpendiculars of the Chutes, those of the middles of the Sheeting Curves, &c. to the inside circular Line of the Tower CED.

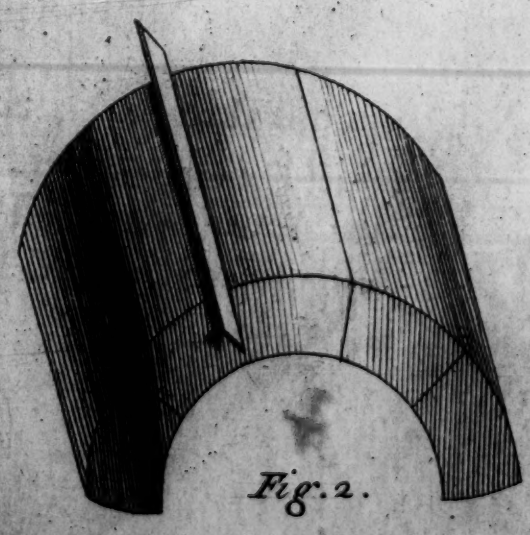
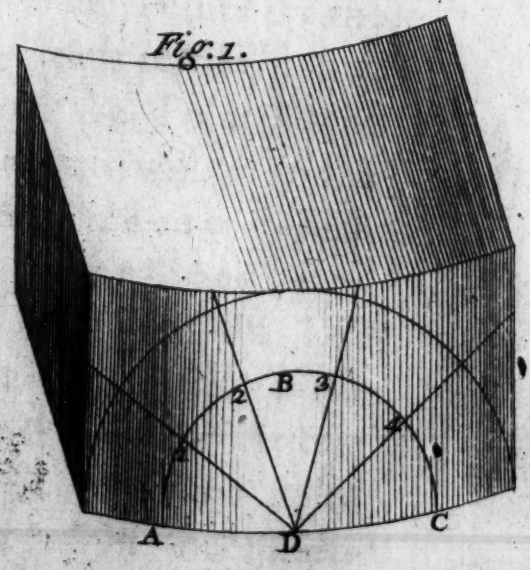
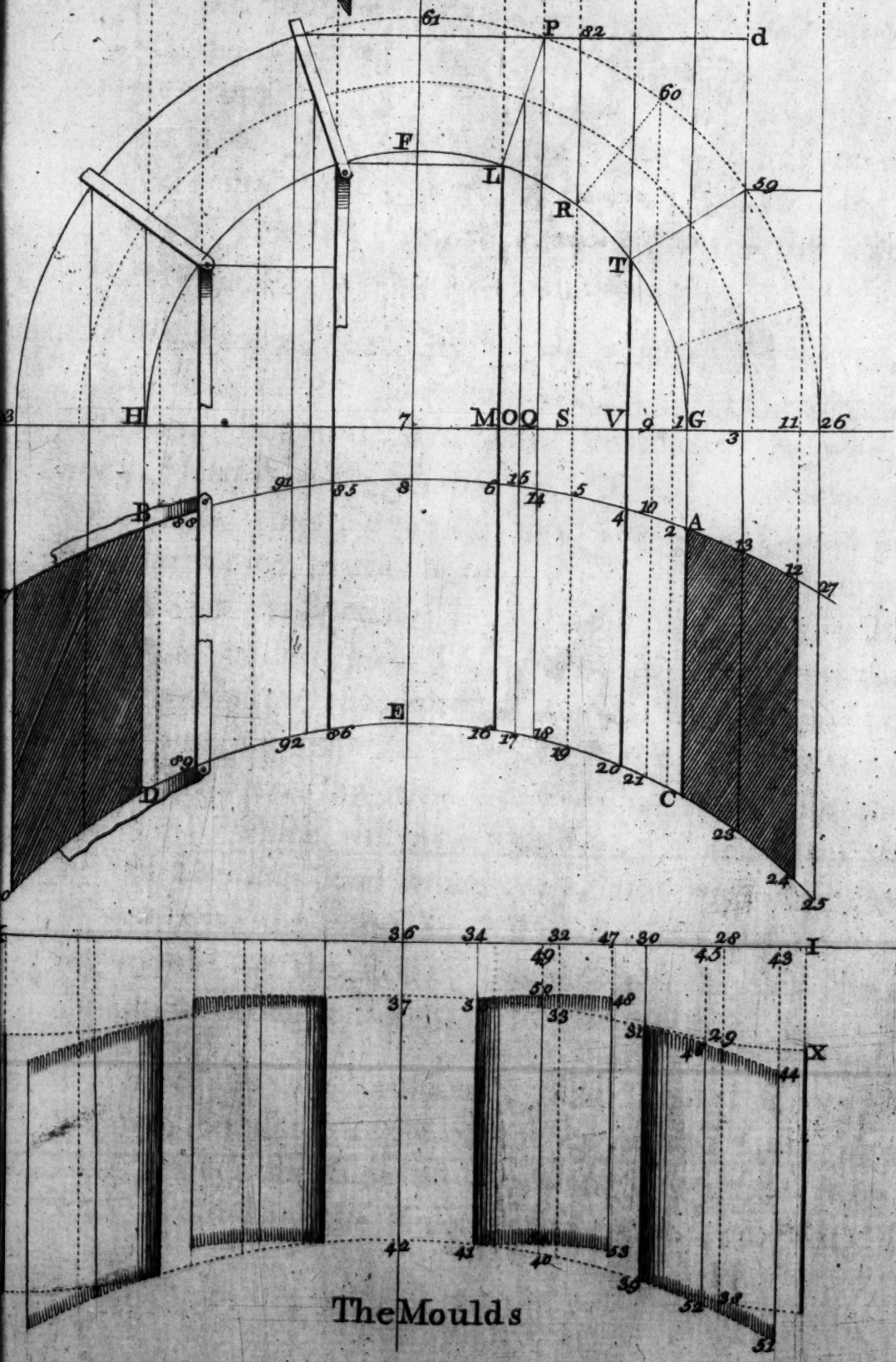
Construction of the Sheeting Moulds.

Having extended the Arcs of the Sheeting Curve on the Line IK, and having drawn the Lines of the Sheeting, and those of the middles of each Sheeting Curve, as before directed; lay off the Distances between the right Line GH, and the circular outside Line of the Tower A 8 B, viz. GA on IX, and on KZ, 1-2 on 28-29, V 4 on 30-31, S 5 on 32-33, M 6 on 34-35, 7-8 on 36-37: then trace the front Curve of the Sheeting X 37-Z: to find the rear Curve lay GC on IY and on KN, 1 C on 28-38; V 20 on 30-39, S 19 on 32-40, M 16 on 34-41, 7 E on 36-42, the same are laid off on the other Side, and trace the rear Curve Y 42 N.

Construction



A straight Gate with a semicircular Arch in a circular Wall or round Tower, traced by Moulds and by the Square.



...with a ...
...
...and ...



Construction of the Joint or Bed Moulds.

Take the Height of the Joint LP, with which draw the Lines of the Joints parallel to those of the Sheetings: draw the middles of the Joints 46-52, 50-54, &c. and lay the Distances, GA on 45-46, 3-13 on 43-44, O 15 on 49-50, Q 14 on 47-48, and trace the front Curve of the Joints 31-46-44, 35-50-48: to find the Length and Rear of the Moulds, for the first Mould lay GC on 45-52, 3-23 on 43-51, and for the second O 17 on 49-54. Q 18 on 47-53 and draw the Rear-line 39-52-51 and 41-54-53: do the same for those on the other Side.

Construction of the Moulds of the Extrados.

These Moulds serve to trace the upper Face of the Stones, when they are to be rounded parallel to the Sheeting Curve of the Arch. Draw apart, the Line 56-57, on which extend the Arc of the Extrados 26-61-93. By laying 61 P on 57-65, P 60 on 65-64, 60-59 on 64-63, 59-58 on 63-62, 58-26 on 62-56: and draw the Lines 56-66, 62-67, 63-68, 64-69, &c. lay the Distances 7-8 on 57-77 square to 56-57, Q 14 on 65-76, 9-10 on 64-75, 3-13 on 63-74, 11-12 on 62-73, 26-27 on 56-72: thro' these Points trace the front Curve 72-74-77: to find the Rear, lay 7 E on 57-71, Q 18 on 65-70, 9-21 on 64-69, 3-23 on 63-68, 11-24 on 62-67, and 26-25 on 56-66 and trace the Curve required 66-69-71; the Figure shews one half of the Extrados only, the other half is traced by the same Method.

To trace and cut these Vouffoirs by Moulds, there is no more difficulty in this, than in the preceding Gates, except in cutting the Heads concave and convex. But to do this truly, there must be many Perpendiculars taken in each Head Moulds of the Arc GFH, in order to have as many Points on the Vouffoirs, which serve to conduct the Ruler plumb on the Heads of the Stones, as represented in the second Vouffoir. For Example, from the Point R the middle of the Sheeting TL, draw a Perpendicular R 82, which will give the Point 82 on the level Line Pd. Then transpose the Interval 18-19 (which corresponds to P 82) along the circular Arras a 83 e, on a 83 e: and thro' the Point 83 draw the Line 83-84 parallel to the Arras ab; take the Distance LR, and lay it on the Sheeting, and draw the Line rs parallel to the Arras gh, which will give the Points r and s on the front and rear Arrases of the Sheeting, and which correspond with the Points 83-84, as the Point R does with the Point 82. The Points r and s are represented in the Sheeting-mould by the Points 33 and 40: in this Manner as many Points are found, as thought necessary.

To cut the first Vouffoirs by the Square: square a Stone, and dress the upper Bed, on which apply on the upper and under Beds, the Plan 87-88-89-90 placing the Side 88-89 along the inside Arras. Dress the Head and Tail, conducting the Ruler square to the two Beds: The Stone thus disposed,

H

trace

trace on the under Bed the Projection of the Curve, or the Chute, and on the Face, the Height of the Chute: having made a Bevel to the Arc GFH, hollow the Sheeting and cut the upper Joint by it, and the Stone is then ready to be placed on its Plan 90—DB—87.

The second Stone must be done the same Way, tracing on its Beds, the Plan B 85—86—D, and the Chute and Height, corresponding to it.

For the Key, dress the Beds and apply the Mould 18—14—91—92, cut the Head and Tail circular as before, trace the Breadth of the Sheeting on the upper Bed, then hollow the Sheeting, and cut the Joints by the Bevel.

PL 13

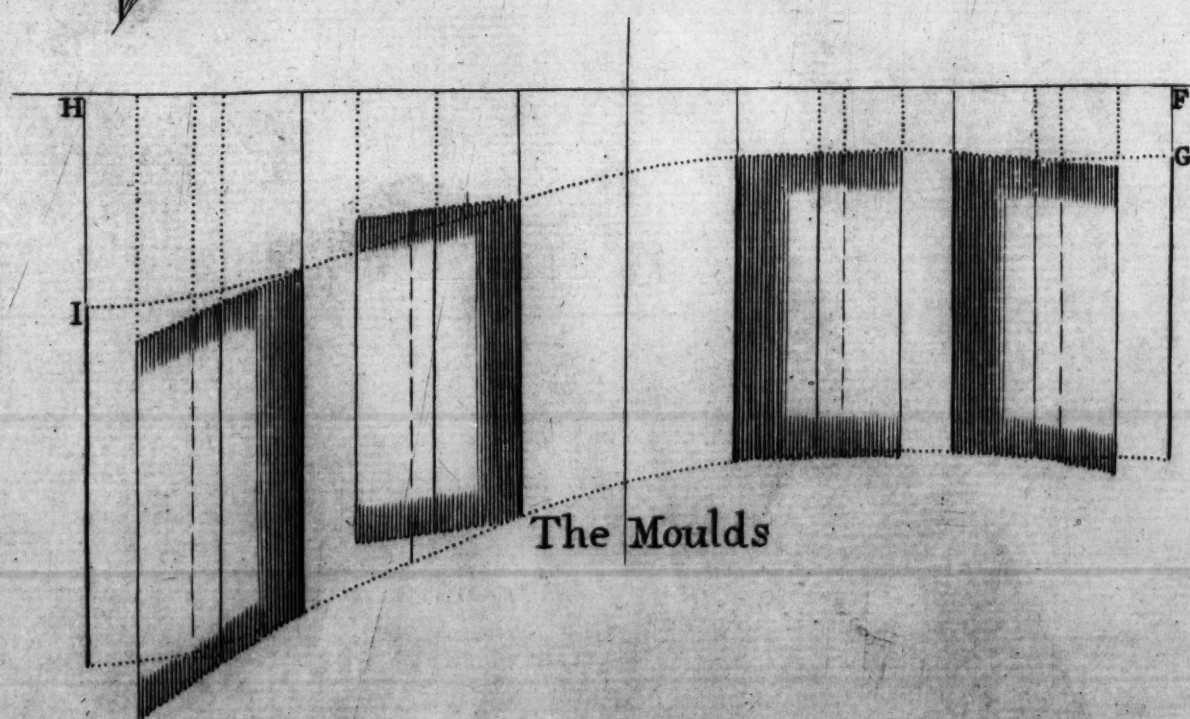
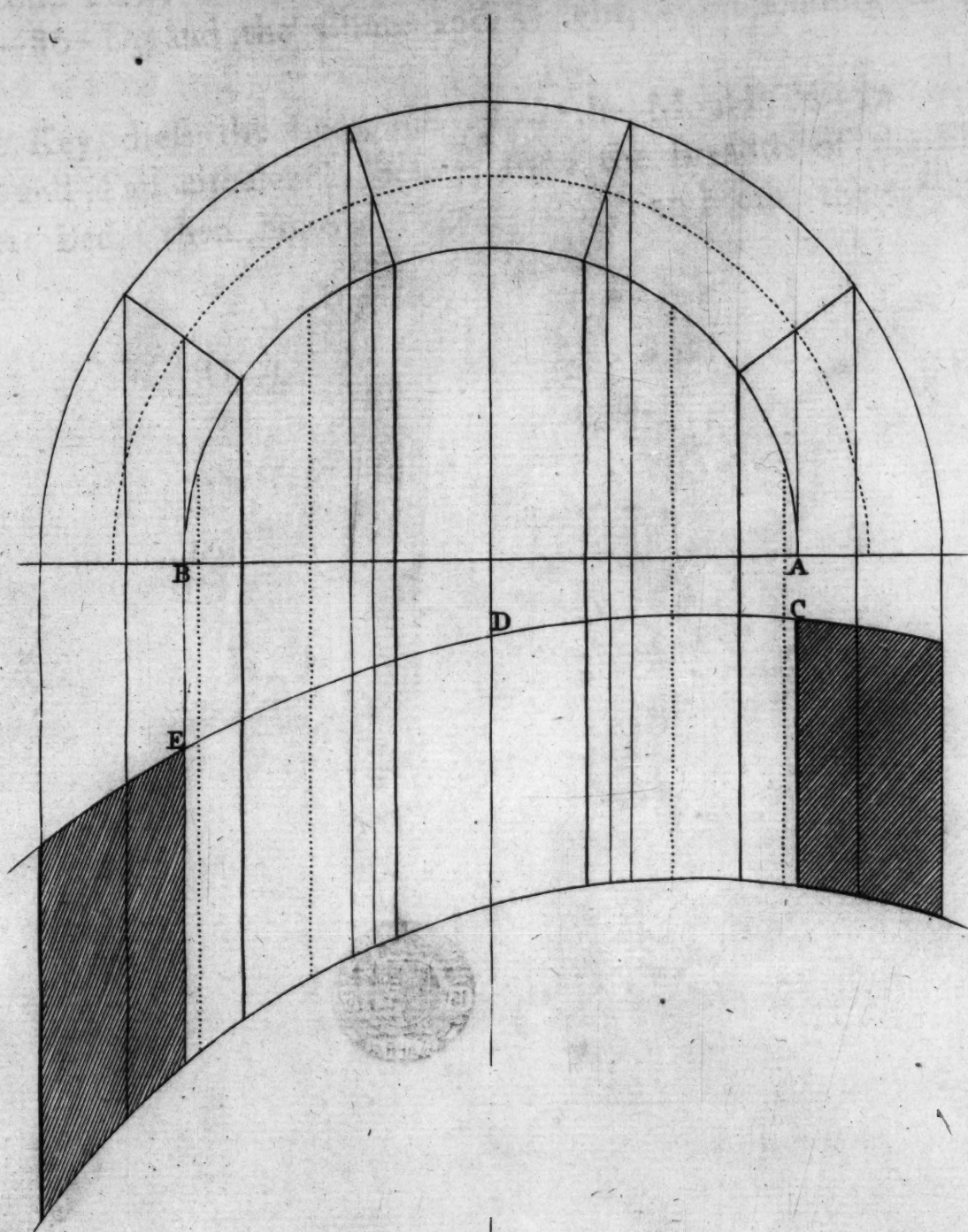
Abeyah's Column and other Wall



The Moles

Abeveld Gate in a circular Wall

PL. 13



CHAPTER XIII.

A bevelled Gate in a circular Tower. Pl. 13.

AS this Trace differs from the preceding only in the bevel or obliquity of the Tower, there requires no particular Description, only to observe that the Bevel causes the Moulds to be longer on one Side, than on the other, as is evident from the Plan, therefore the Distances taken between the right Line A B, and the circular Line of the Tower, C D E, being unequal, must be transposed, each on its particular Line of the Mould and Joint, to which they correspond in the Trace, that is the Distance A C must be laid on F G, B E on H I and so of the rest. The Obliquity of the Tower is here drawn at Pleasure.

CHAPTER XIV.

A bevelled Gate in a round battering Tower, and butting or intersecting a semicircular Arch. Pl. 14.

THIS Trace must be the same as the two former, to which add, the Retreats of the Batter, and the Projections of the semi-circular Arch; therefore on one Side draw the Line of Batter A B and on the other the Arch C D: draw the parallels from the Divisions of the Sheatings, their middles, &c. (as in the Figure) to cut the Batter Line and Arch. To work for the Batter, lay all the Retreats comprised between the Perpendicular A H, and the Line of Batter A B, on the Perpendiculars of the Sheeting, &c. &c. square to the front Line of the Tower F 19 G as follows.

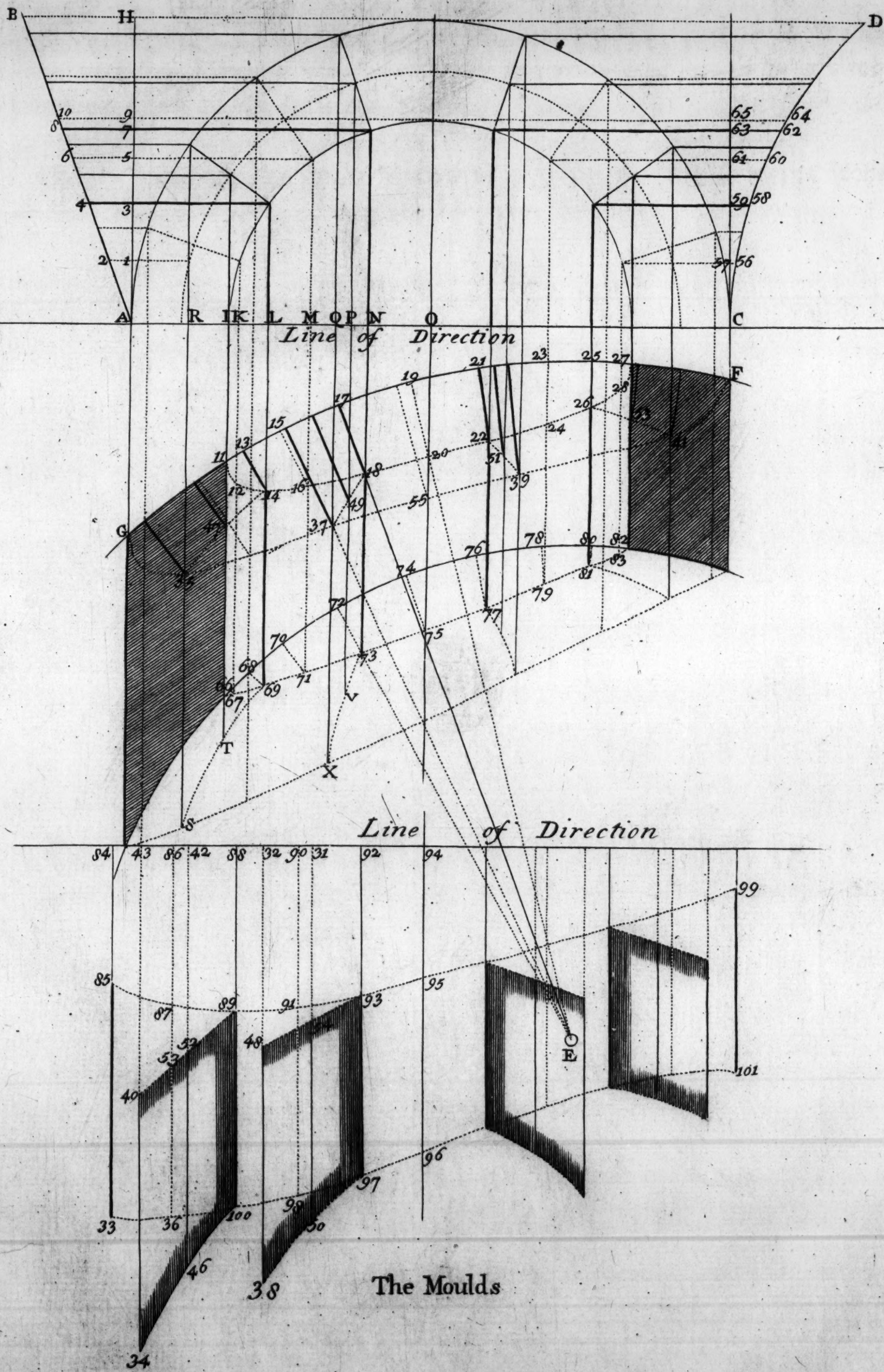
Transpose the Retreat 9-10 on 19-20, placing the Compasses so that the Line 19-20 passes through E the Center of the Tower, and the Point 20 falls on the Center Line of the Gate O 75; lay 7-8, on 17-18 and on 21-22 in the same manner (only terminated by the Lines from the Sheeting instead of the Center Line of the Gate) lay also 5-6 on 15-16 and on 23-24, 3-4 on 13-14 and on 25-26, and lastly 1-2 on 11-12 and on 27-28, and through these Points trace the Sheeting-curve 28-20-11: The Crown or Extrados is found in like manner, and the middles of the Joints 47-49-51-53; which done, draw the Plan of the Joints 14-47-35, 18-49-37, 22-51-39, and 26-53-41.

To find the Curve in Plan, which terminates the Tails of the Moulds, lay the Projections or Buttings of the semi-circular Arch square to the inside Line of the Tower, viz. 64-65 on 74-75, 63-62 on 72-73 and on 76-77, 60-61 on 70-71 and on 78-79, 59-58 on 68-69 and on 80-81, 56-57 on 66-67 and on 82-83, then trace by Hand the Curve 83-75-66. Find the Curve of the Extrados and Joints by the same Method.

To find the Moulds of the Sheeting.

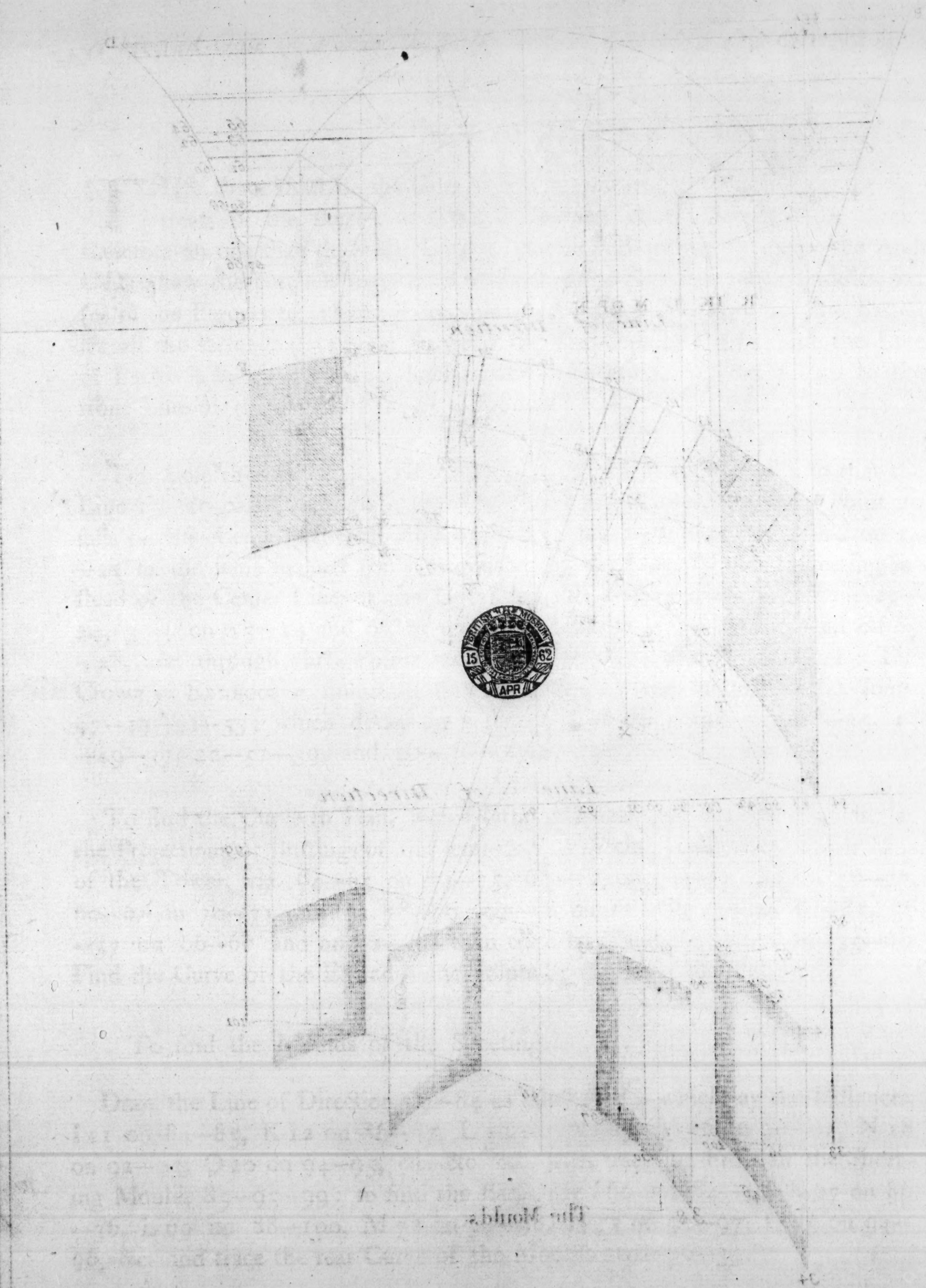
Draw the Line of Direction 94-84 as usual, below which lay the Distances, I 11 on 84-85, K 12 on 86-87, L 14 on 88-89, M 16 on 90-91, N 18 on 92-93, O 20 on 94-95, &c. &c. &c. then trace the Front of the Sheeting Moulds 85-95-99: to find the Rear, lay I 66 on 84-33, K 67 on 86-36, L 69 on 88-100, M 71 on 90-98, N 73 on 92-97, O 75 on 94-96, &c. and trace the rear Curve of the Moulds 101-96-33.

A Gate bevel'd in a circular batter'd Wall and butting a semicircular Vault



PL. 14

A Gate levelled in a straight line and putting a semicircular wall



To find the Moulds of the Joints.

Transpose P 49 on 31--54, Q 37 on 32--48, I 47 on 42--52, R 35 on 43--40: and through these Points trace the front of joint or bed Moulds 93--54--48, 89--52--40: to find the Rear make 31--50 equal to P V, 32--38 equal to Q X, 42--46 equal to I T, and 43--34 equal to R S, which done trace the Curve Lines 97--50--38, and 100--46--34. The two other Joints are found by the same Method.

Having already explained the Manner of applying the Moulds to the Stones, we shall not repeat it here, or in the following Gates.

CHAPTER XV.

A bevelled Gate in a circular battering Wall, with Voussoirs of equal Heads.

Pl. 15.

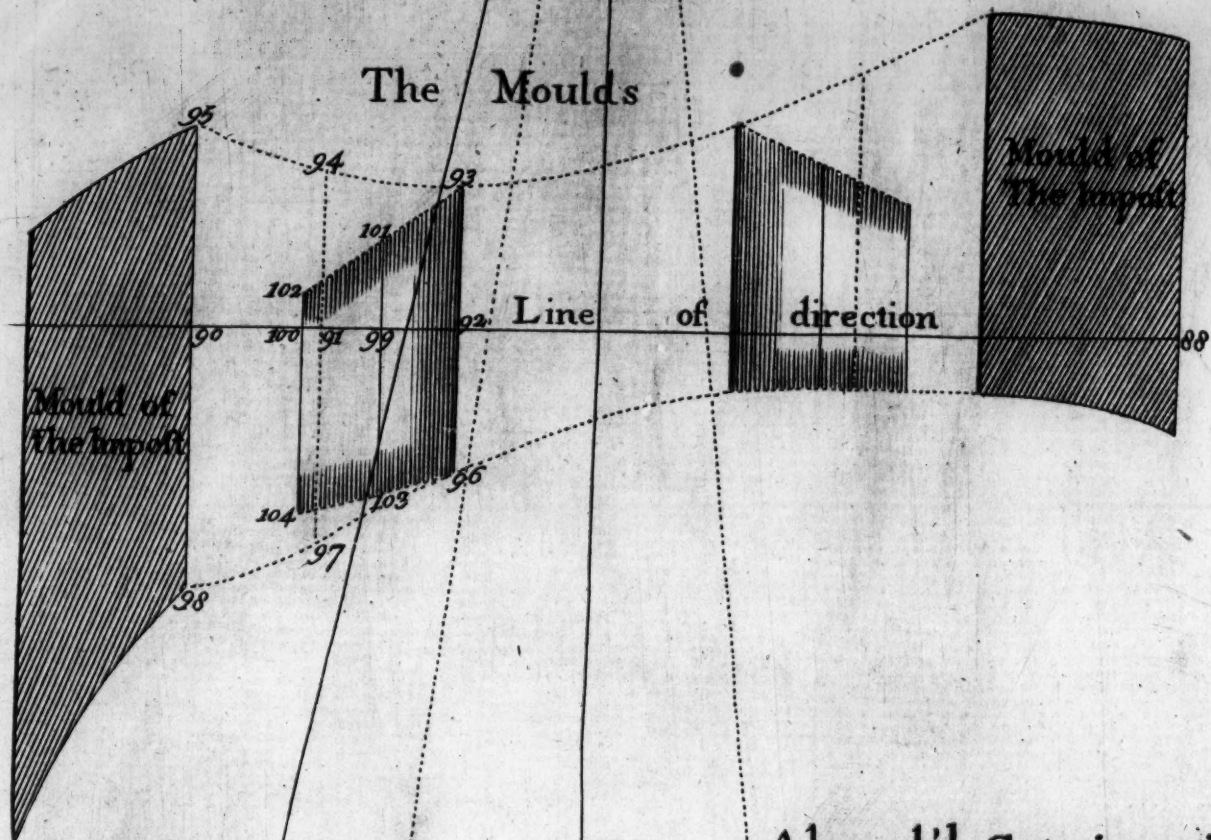
TO conceive the Trace of this Gate, it must be supposed to be constructed in a Cone; and as it is required that the Heads of the Voussoirs be equal, the Divisions must be made on the Center of the Face of the Wall, whose Base is a Curve: in the following Operation will be described the manner of drawing this Base, as also of forming the Center demanded.

Draw the Line AB and from the Point B as Center, draw the inside and outside Lines of the circular Wall FGH, CDE draw the Line of Batter DL; draw the Line BK square to BD, and prolong this Line and the Line of Batter, till they meet in the Point L: take the Length DL and lay it from D to A; from the Point A as Center describe the required Base MDN: from the Point D as Center, describe (with the Span of the Gate) the Arc OPQ, its outside Curve, and the Center dotted Arc. Divide these Centers into as many Parts as there are to be Voussoirs, to avoid a Confusion of Lines, we have here supposed only three.

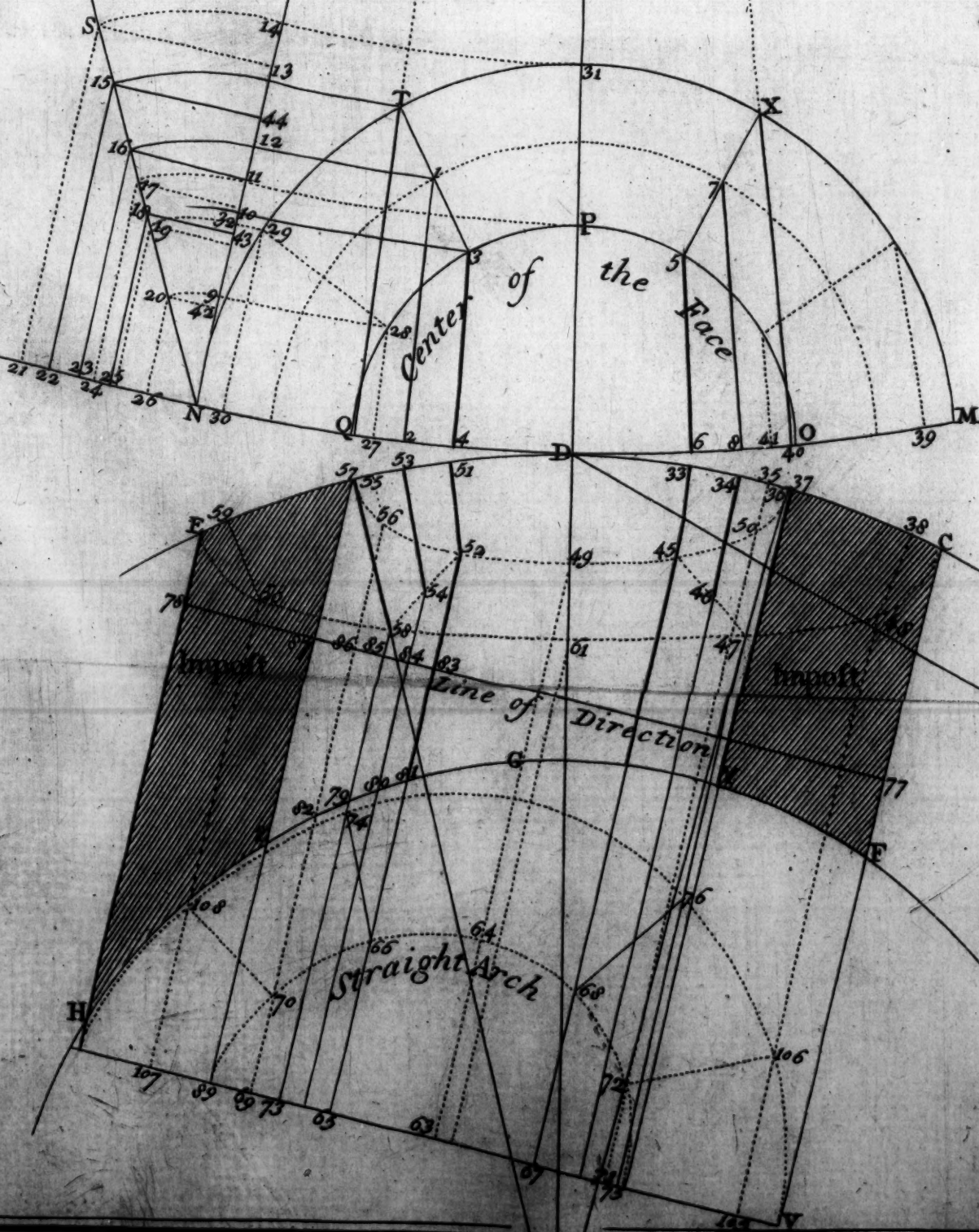
By the Center A and the Points where the Joints cut the Arcs, draw the Lines TQ, 1-2, 3-4, 5-6, 7-8, XO, &c. to the Curve MDN: then draw the Line AN, and from the Point N the Line NR square to AN: on NR raise the Line of Batter NS, making the Angle RNS equal to the Angle BDI; on NA lay all the Heights of the Center, as 27-28 on N 9; 4-3 on N 10, DP on N 11, 2-1 on N 12, QT on N 13, D 31 on N 14: then from N as Center describe the Arcs 14 S, 13-15, 12-16, 11-17, 10-18, &c. which cut NS in the Points S 15-16-17-18, &c. through which draw the Lines S 13, 15-44, 16-11, 17-10, 18-43, &c. parallel to NR; on NR draw the Perpendiculars S 21, 15-22, 16-23, 17-24, 18-25 by which (as shall be shewn hereafter) the straight Arch is to be constructed.

On the circular Wall CDE, lay the Distances which the inclined Lines (proceeding from the Sheeting Curves and Joints) have made on the Curve MDN, that is lay the Distances D 6 on D 33, 6-8 on 33-34, 8-41 on 34-35, 41-40 on 35-36, 41 O on 35-37, O 39 on 37-38, 39 M on 38 C, and repeat the same on the other Side.

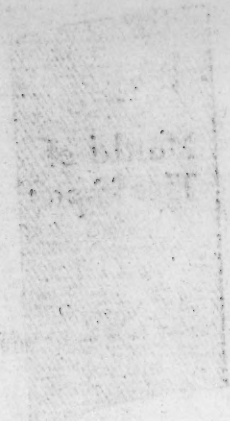
From the Center B draw the Lines 33-45, 34-46, 35-50, 36-47, 38-48, &c. then on these Lines lay the Retreats of the Batter, below the circular Wall, that is, 42-20 on 35-50, and on the other Side on 55-56, 18-43 on 33-45 and on 51-52, 17-10 on D 49, these Points serve to trace the Plan of the Retreats of the Batter, 37-49-57.



Abevel'd Gate in a circular, batter'd Wall with equal Vouffoirs in Front.

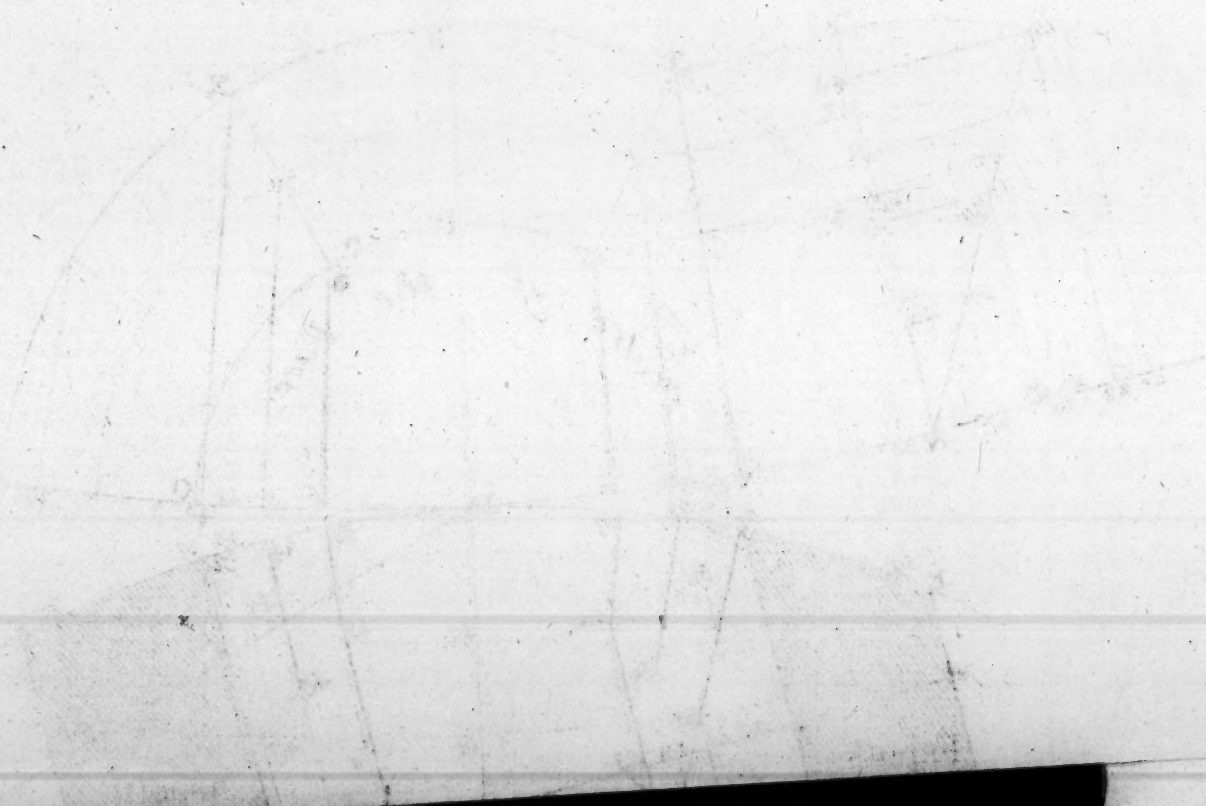


PLATE



of the

of the ...
with ...



For the Extrados, or outer Curve lay 19-43 on 38-48 and on 59-60, 15-44 on 57-58 and on 36-47, S 13 on D 61 and trace the Line C 61 E: lay the middle of the Joints also, 16-11 on 53-54 and on 34-46, to find the Trace of the Joints in Plan, 52-54-58 and 45-46-47. From the Point 49 draw at pleasure the Line 49-63, and the Lines of the Plan E H, 57-Z, 37-Y, C F parallel to 49-63 and also those which proceed from the Sheeting Curves, Joints, &c. 56-69, 58-73, 52-65, 45-67, 47-71, &c.

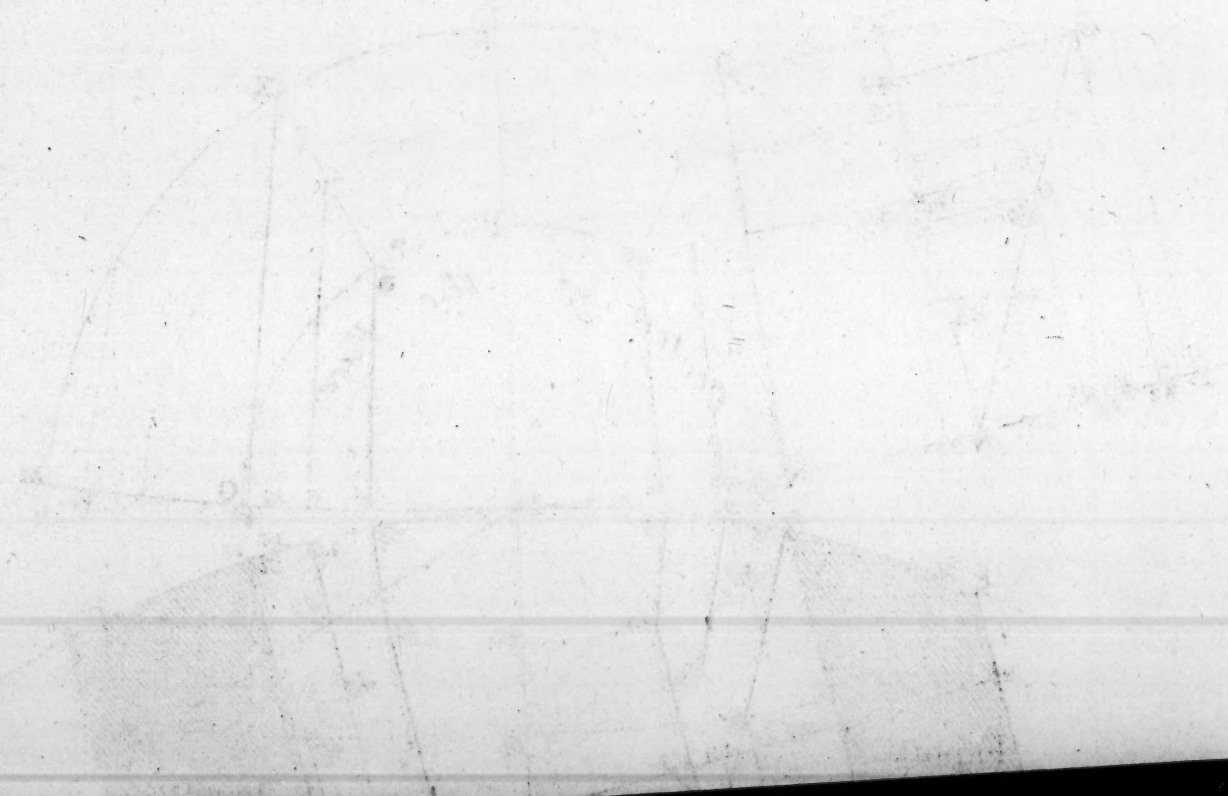
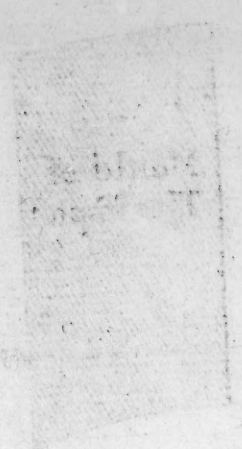
To form the straight Arch, draw at pleasure on the bevelled Lines the Perpendicular H V, above which lay off on the said Lines, the Heights of the Aplombs represented under the Batter NS, for Example lay the Height 26-20 on 69-70 and on 71-72, 18-25 on 65-66 and on 67-68, 17-24 on the Middle 63-64, and trace by Hand the Arch 75-64-89; the Extrados is found by laying 19-25 on 105-106, and on 107-108, 22-15 on 73-74 and 75-76, then draw the Joints 66-74 and 68-76.

We shall shew how to form one Sheeting-Mould and one Joint-mould, which will be sufficient for understanding the rest.

Draw at pleasure the Line of Direction 77-78 square to the Bevel 49-63: and having laid down the Breadths of the Moulds on the Line 88-90 (above the Plan) according to the Arch 75-64-89, lay the Distances 87-57 on 90-95, 86-56 on 91-94, 83-52 on 92-93, and trace the Front of the first Sheeting-mould 93-94-95; then lay off 87 Z on 90-98, 86-82 on 91-97, 83-81 on 92-96 and trace the Rear of the said Sheeting-mould 96-97-98.

For the Front of the first Joint or Bed-mould, lay 84-54 on 99-101, 85-58 on 100-102, and draw the curved Line 93-101-102; to find the Rear of it, lay 84-80 on 99-103, 85-79 on 100-104 and draw the curved Line 96-103-104.

17. 17



For the Extrados, or outer Curve lay 19-43 on 38-48 and on 59-60, 15-44 on 57-58 and on 36-47, S 13 on D 61 and trace the Line C 61 E: lay the middle of the Joints also, 16-11 on 53-54 and on 34-46, to find the Trace of the Joints in Plan, 52-54-58 and 45-46-47. From the Point 49 draw at pleasure the Line 49-63, and the Lines of the Plan E H, 57-Z, 37-Y, C F parallel to 49-63 and also those which proceed from the Sheeting Curves, Joints, &c. 56-69, 58-73, 52-65, 45-67, 47-71, &c.

To form the straight Arch, draw at pleasure on the bevelled Lines the Perpendicular H V, above which lay off on the said Lines, the Heights of the Aplombs represented under the Batter NS, for Example lay the Height 26-20 on 69-70 and on 71-72, 18-25 on 65-66 and on 67-68, 17-24 on the Middle 63-64, and trace by Hand the Arch 75-64-89; the Extrados is found by laying 19-25 on 105-106, and on 107-108, 22-15 on 73-74 and 75-76, then draw the Joints 66-74 and 68-76.

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For the Front of the first Joint or Bed-mould, lay 84-54 on 99-101, 85-58 on 100-102, and draw the curved Line 93-101-102; to find the Rear of it, lay 84-80 on 99-103, 85-79 on 100-104 and draw the curved Line 96-103-104.

CHAPTER XVI.

A bevelled Gate in a circular battering Wall, or round Tower, butting or intersecting a Vault formed round a Newell; traced by the Square. Pl. 16.

IT is not necessary to enlarge much on this Plan, provided the last be understood, we shall therefore only explain what particular Parts differ from it.

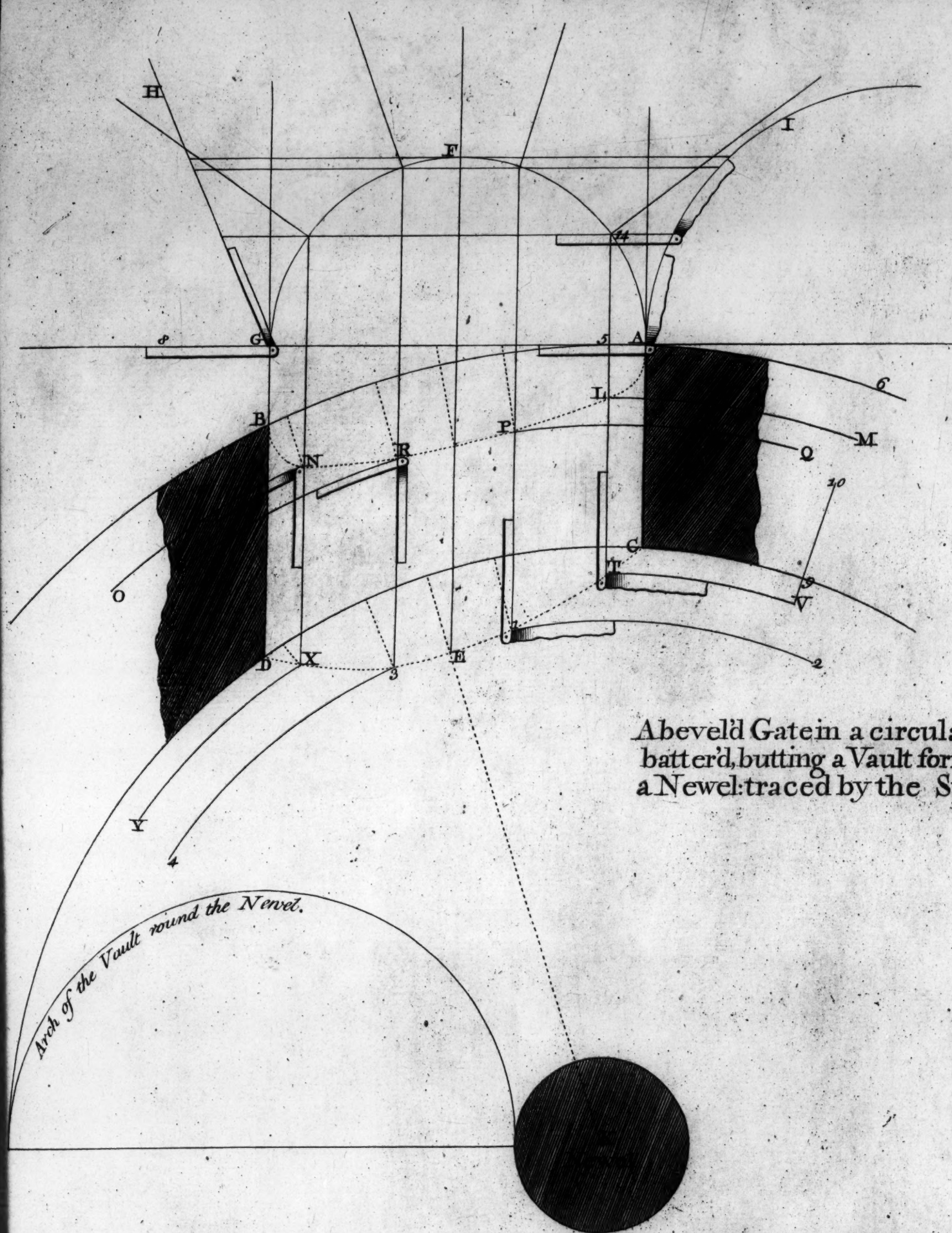
Let ABCD be the bevelled Plan of the Gate in the circular Wall; draw the middle Line EF parallel to the Sides of the Plan AC or BD, draw at pleasure the Line AG square to EF; on the Line AG describe the Arch AFG equal to the Span of the Gate, and divide it into five Voussoirs: draw the Line of Batter GH, and describe the Semi-circle AI equal to the Arch of the Vault round the Newell; draw the Lines from the Divisions of the Sheeting, to the battering Line and to the semi-circular Arch, as in the Figure.

Lay off the Retreat of the Batter on the Front of the circular Wall, and the Projections of the semi-circular Vault below the Wall, then placing one Foot of the Compasses in K the Center of the Tower or circular Wall, draw the circular Lines LM, NO, PQ, RS, TY, XY, 1-2, 3-4: then with a curved Bevel, take the mixt Angles which these circular Lines form with those of the Sheeting Curves, as is represented in the Figure.

Chuse a proper Stone and dress the Bed of it, on which with the Bevel, trace the Plan 6-5-TV-10 then batter the Front of it, with the Angle 8 GH; the Sheeting Side will be square to the Bed as also the hollowed Side TV and Joint V 10. These Sides being dressed as in Fig. 1. lay off the Chute A 5 square, by the Arras of the under Bed, to draw the dotted Line 11-12: lay off also the Chute 9 V, by the Arras of the hollow or concave Side, to trace with a Templet cut to the Sweep CD,) the Curve 11-13: take the Height of the Chute 5-14 and on the two Sides mark the Lines 15-16, 16-17: hollow the Sheeting of the Gate by a Templet cut to the Center AFG, and work off the Joint square to the Sheeting, with a Bevel opened by the same Arch: with a Templet cut to the Arch of the Vault, AI, hollow that Side of the Stone, which must form an Arras with the first Sheeting Curve by its Meeting or Intersection: work off the joint Face or bed Mould which must also form an Arras by its meeting the other joint Face: which being done the Stone will be finished, and have received the form represented in the 2d Figure. The other Stones are formed by the same Method, as will readily be conceived after cutting one Stone.

The Bevels N, R, &c. which shew on the Trace the manner of taking the mixt Angles XNO, 3 RS, &c. will serve to trace the circular Wall, on the under Beds of the Voussoirs to which they belong.

CHAPTER



Abevel'd Gate in a circular Wall
batter'd, butting a Vault formed round
a Newel: traced by the Square.

Fig. 2.

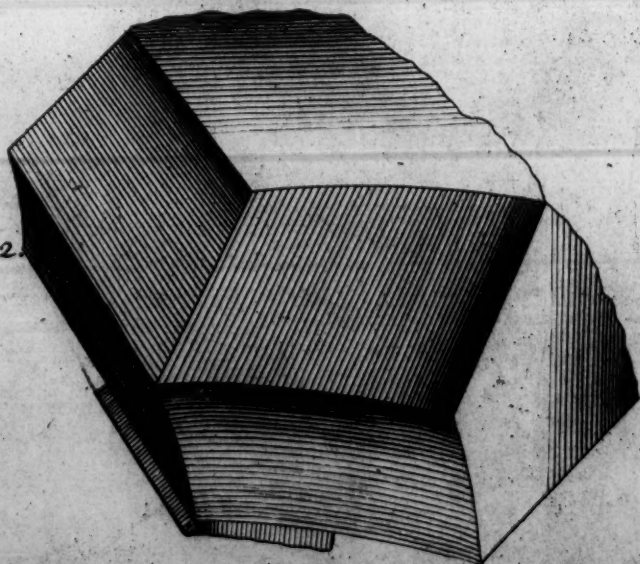
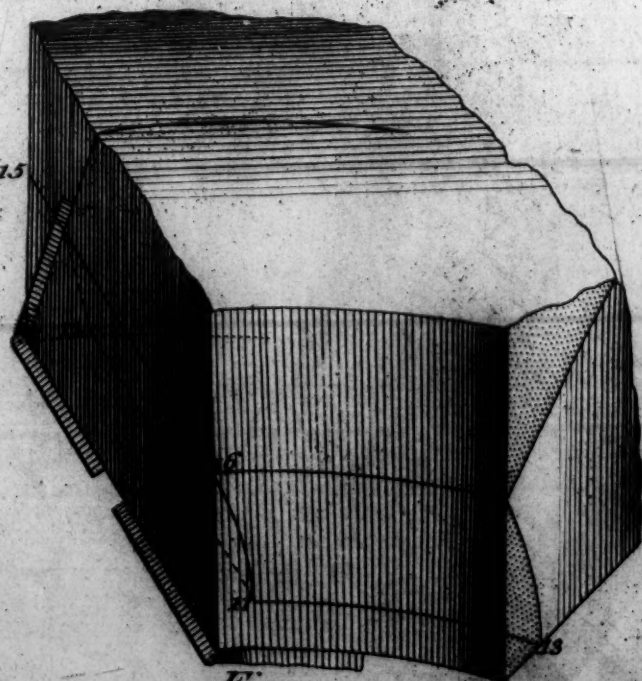
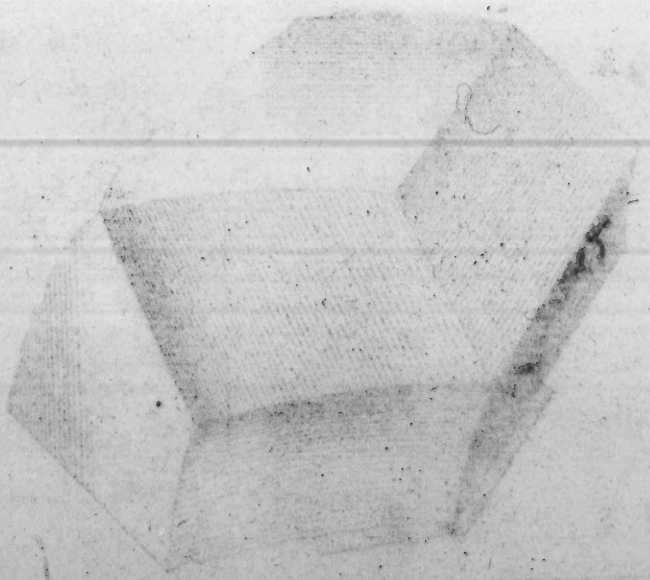
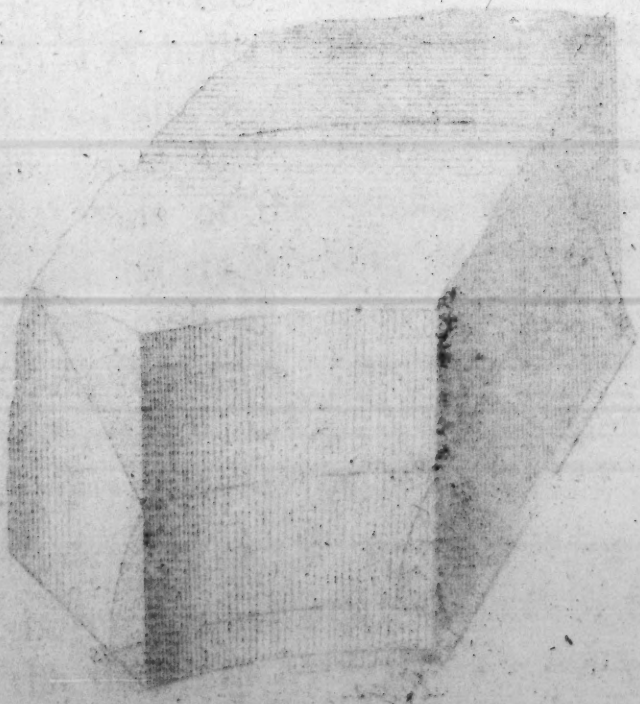


Fig. 1.



11.10

The W. side of a circular Wall
showing a Vault formed round
the base of the column.



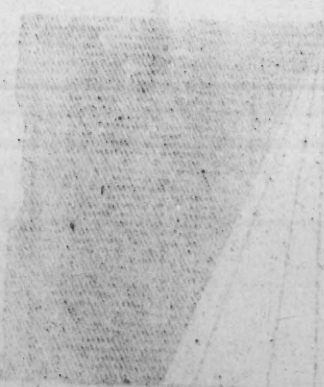
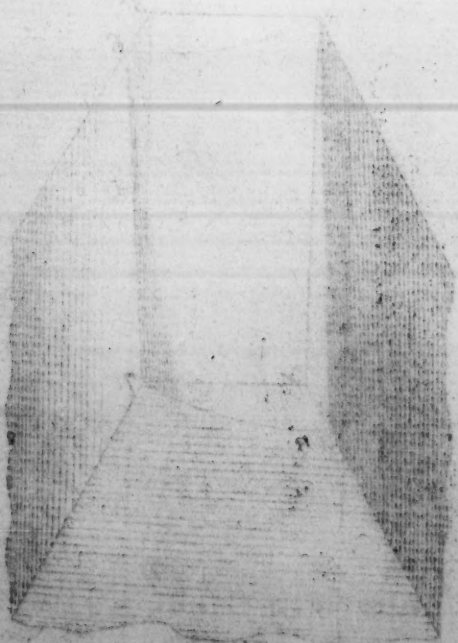
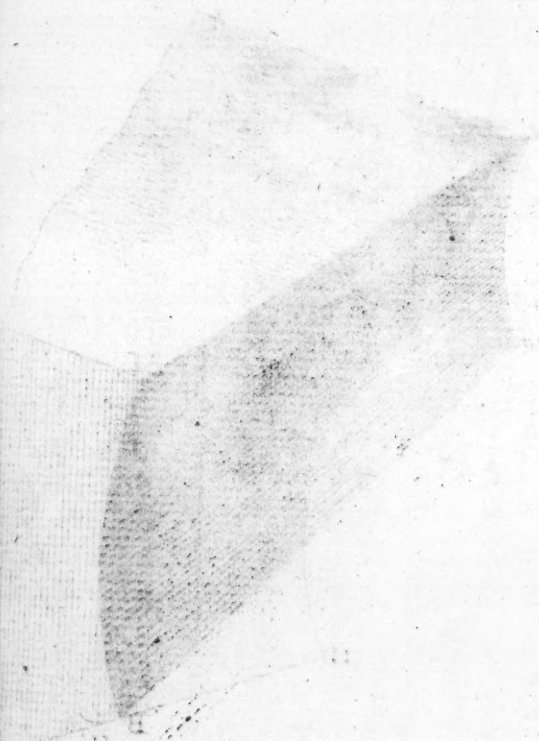


Fig. 1

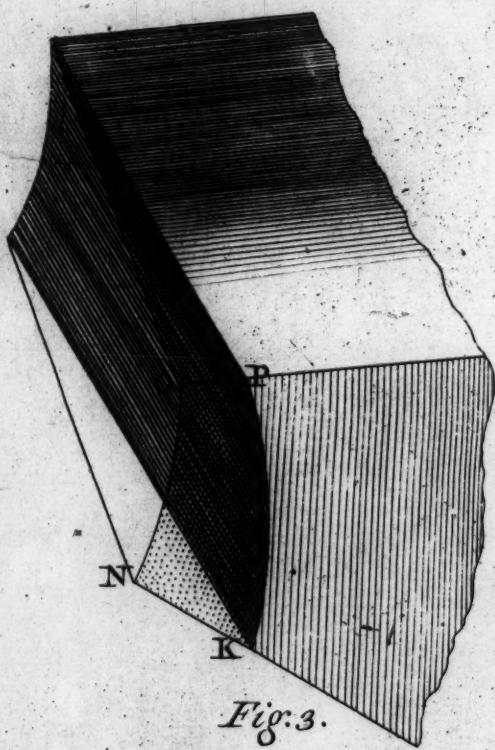
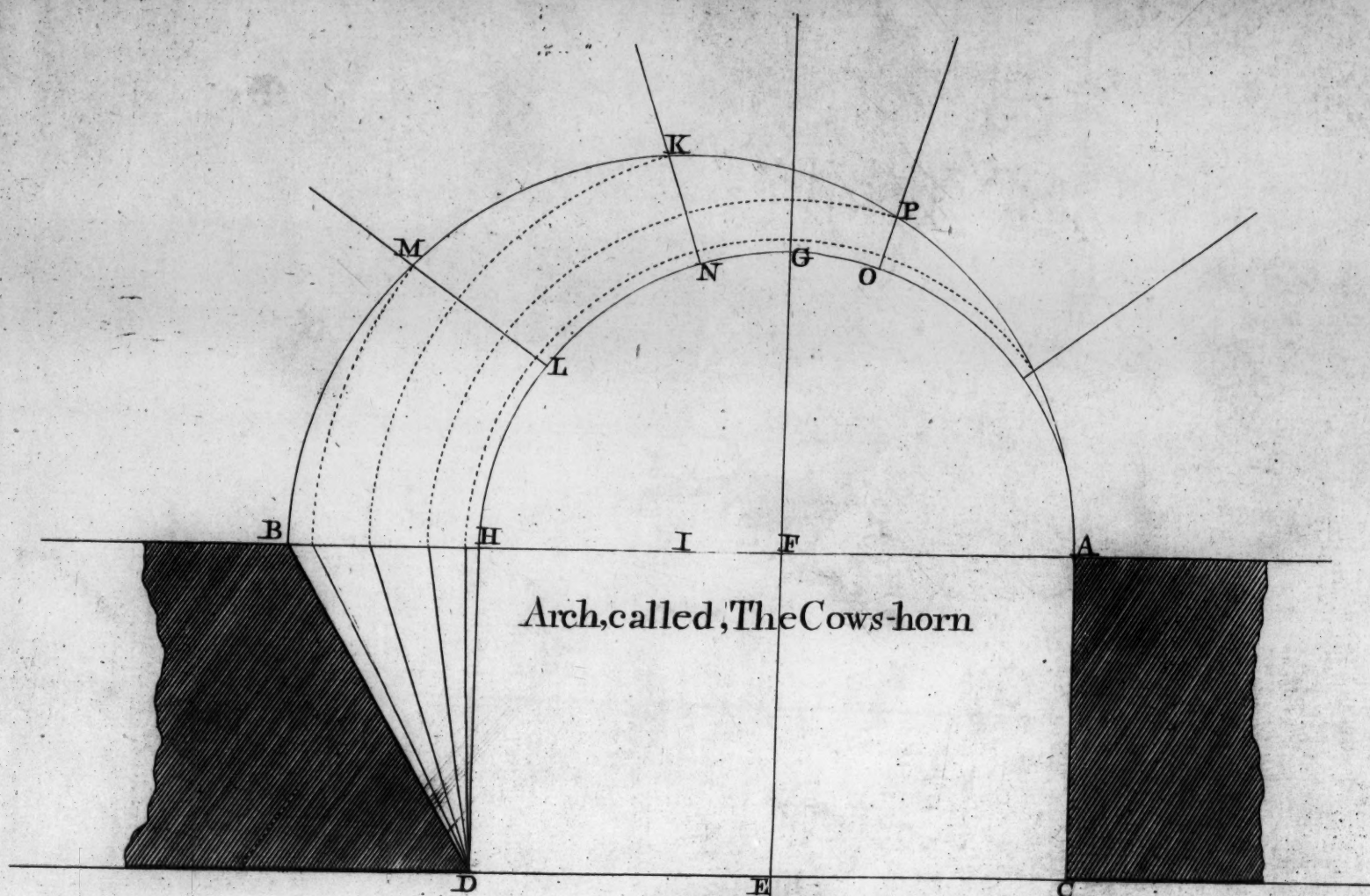


Fig. 3.

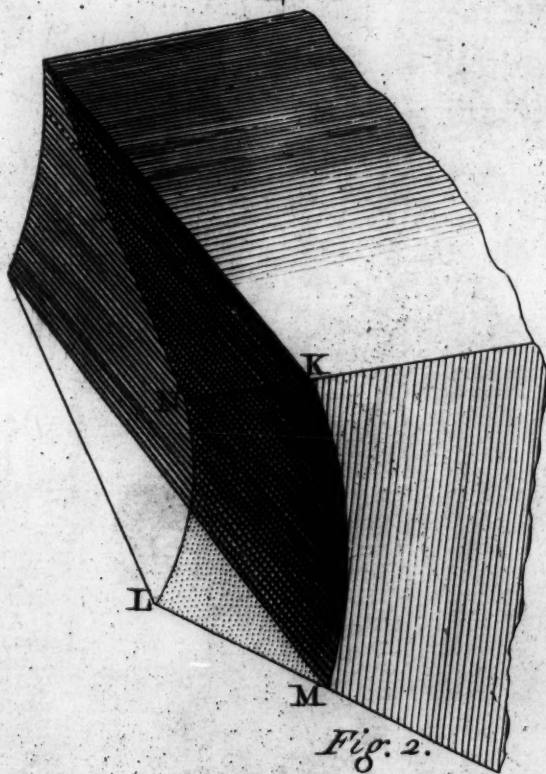


Fig. 2.

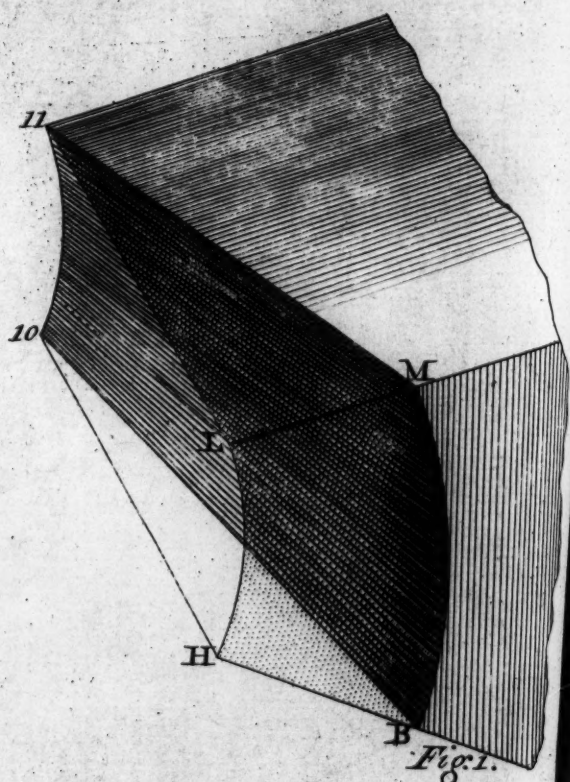
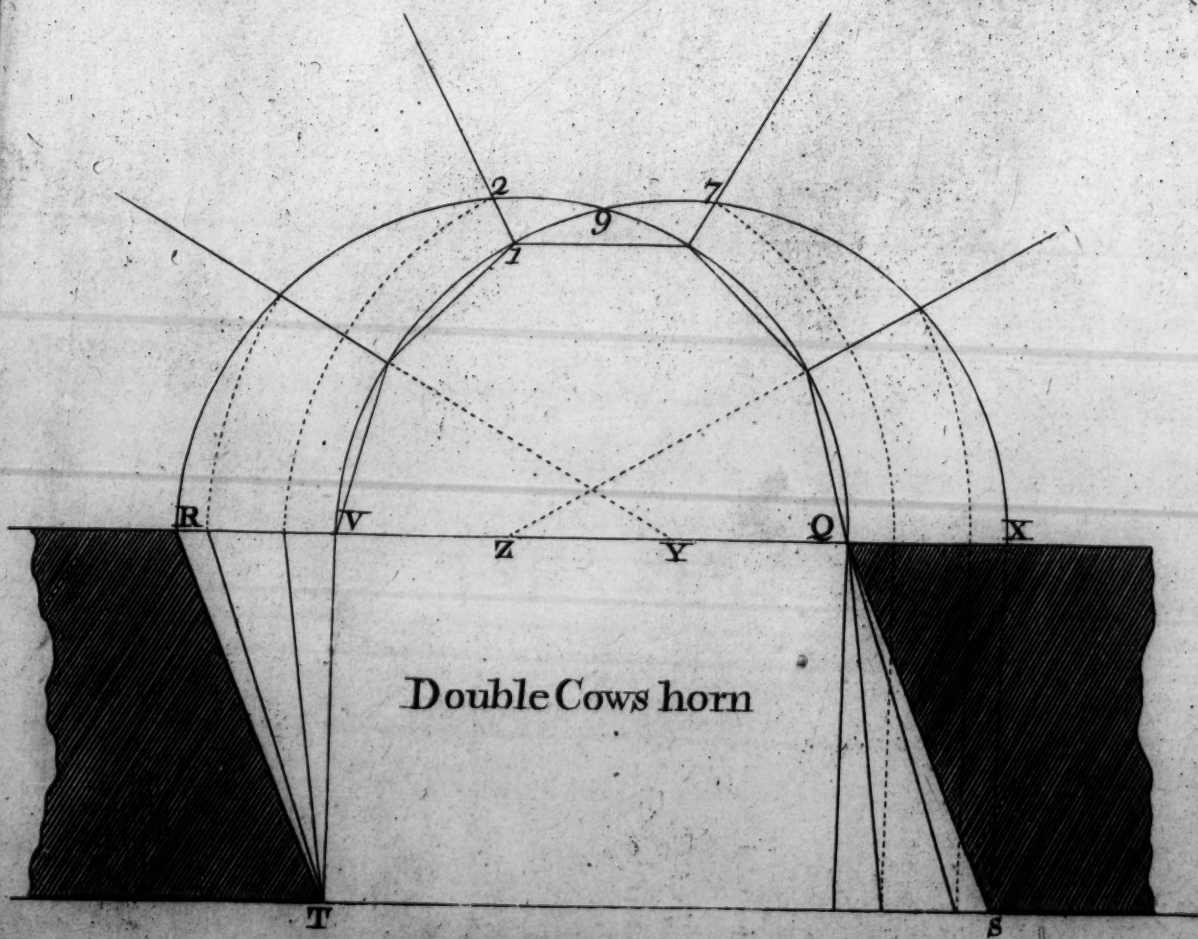


Fig. 1.



Double Cows horn

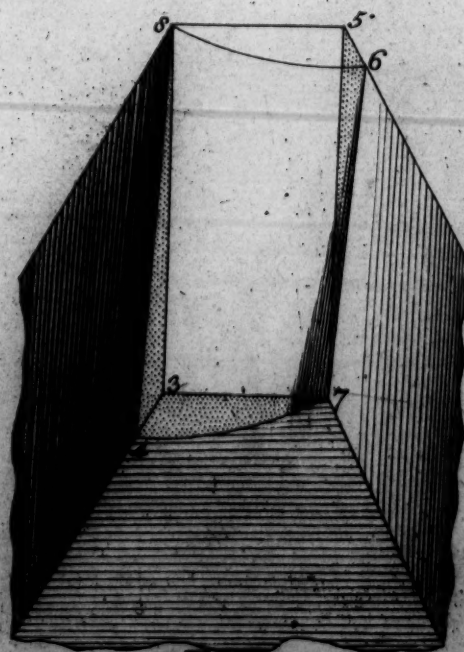


Fig. 4.

CHAPTER XVII.

Of the Arch called the Cow's Horn. Pl. 17.

THE Cow's Horn is an arched Passage bevelled on one Side only, whose Sheeting Stones consequently are wider on one Side than on the other. This is frequently used in large Cities or crowded Buildings.

Let ABCD be the Plan; divide CD into two equally in the Point F, and raise the Perpendicular EF, and its parallel DH; from the Point F as Center, describe the Arch AGH, divide AB into two equally in the Point I, from which as Center, describe the Arch AKB: divide the Arch AGH into five Voussoirs, and draw the Joints from the Center F.

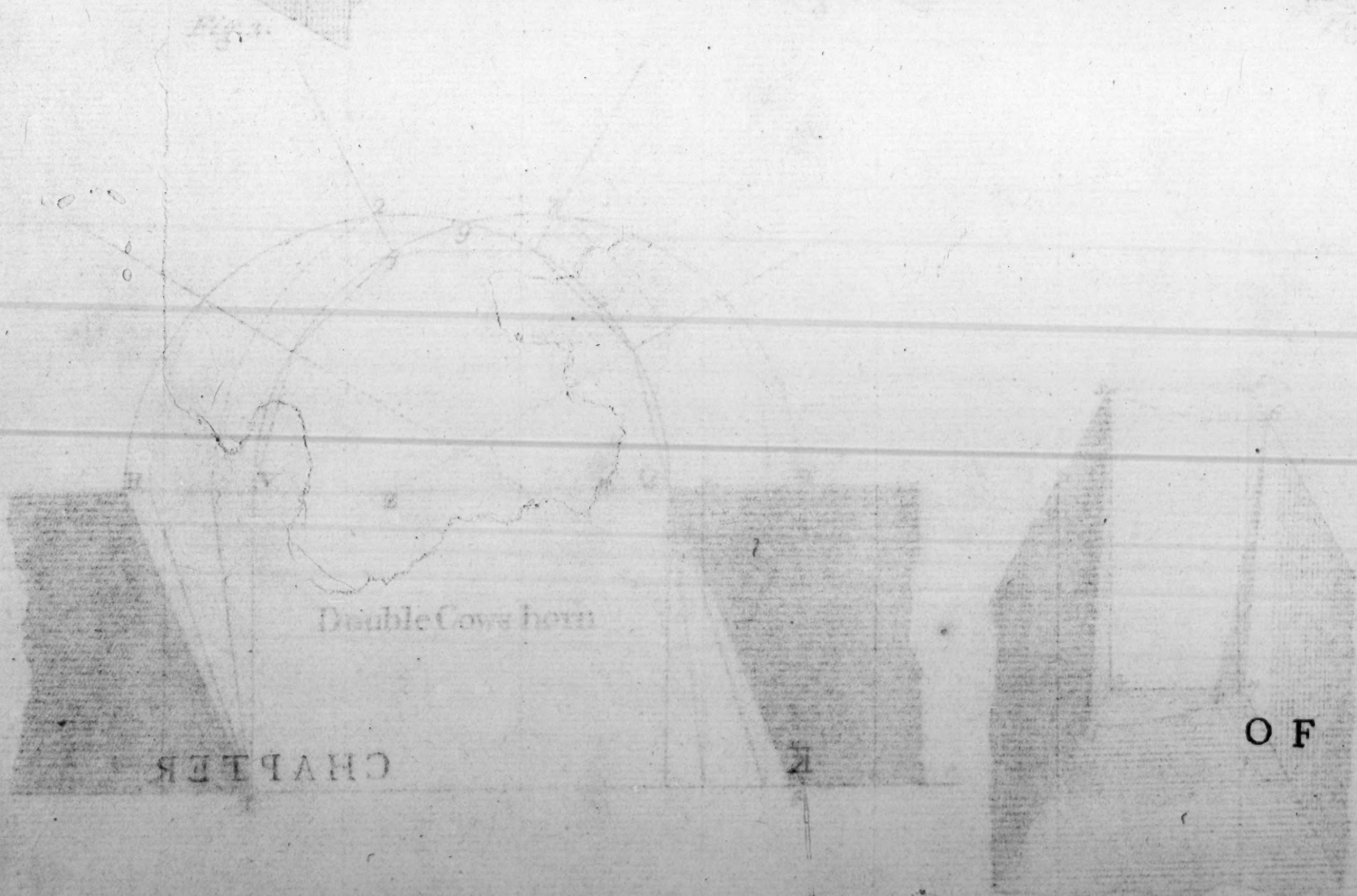
Make a Mould for the Head of a Voussoir of the Arch AGH, by which cut the Stones, as for a straight common Gate; then take the first Voussoir which must be placed on the Impost BD and lay towards the Rear the Distance HB, along the under Joint, and on the upper Joint the Interval LM; by these two Points trace the Curve BM, of the Arch AKB: dress the Stone by this Curve, coming to nothing at the Extremity of the other End of the Sheeting 10-11, and the Voussoir will represent Fig 1; to render the whole intelligible, the second Voussoir and the Key Stone are represented in Figures 2 and 3 where the Letters correspond with those in the Trace.

CHAPTER XVIII.

Of the bevelled Passage, or double Cow's Horn. Pl. 17.

THIS Plan has so much Connection with, and is so similar to the last, that it is needless to enter into an Explanation: The Plan shews it is no more than the double of the last; but as we would omit nothing useful in a work of this Kind, we shall treat particularly of what it differs from it.

Let the oblique Plan QRST be given at pleasure; divide QR into two equally in the Point Z, from which as Center, describe the Arc Q²R; from the Point T raise the Perpendicular TV, and from S the Perpendicular SX, divide the Interval XV, into two equally in Y, from which as Center, describe the Arch X⁷V, which crossing the other Arch, forms the Gothic Center Q⁹V, which must be considered as the straight Arch, and the Vouffoirs must be cut by it: in order to which, divide it into five Parts and draw two Joins from the Center V and two from the Center Z; dress the Vouffoirs as if the Gate was not bevelled, as in the last Example, observing that the Opening of this Arch has on each Side a contrary Effect. The Key is formed as in Fig. 4. by laying the Distance 1-2 on one Side on 3-4, and on the other, on 5-6, &c. by these Points, and by the Help of a Templet cut to the Sweep of one of the two Arches Q⁹R, or X⁷V, trace on the Head and Tail of the Vouffoirs, the Curves 7-4 and 6-8, by which hollow the Sheeting 6-8, 4-7; and so of the rest.



a. Inset
b. Revolved
c. Splined
d. Volume

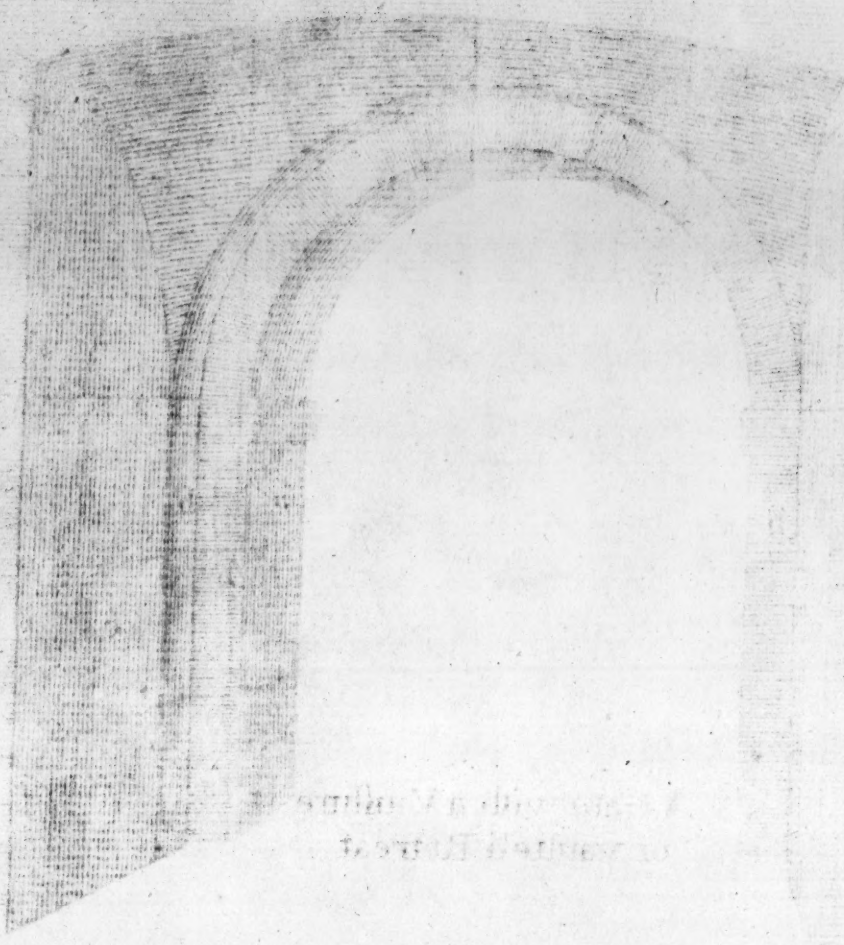
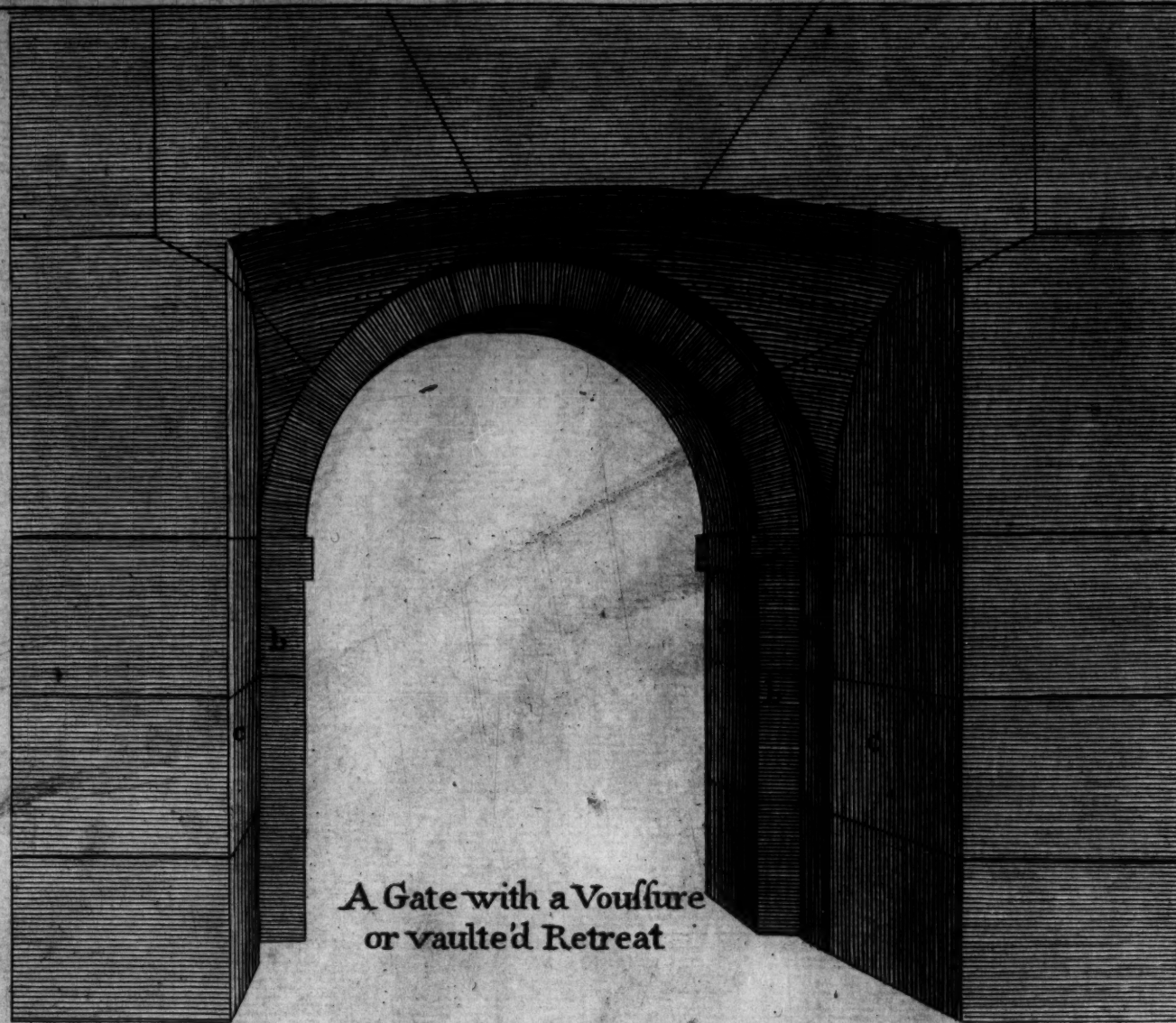


Fig. 1
Fig. 2





- a Impost
- b Reveal
- c Splayd Retreat
- d Vouffure

A Gate with a Vouffure
or vaulted Retreat

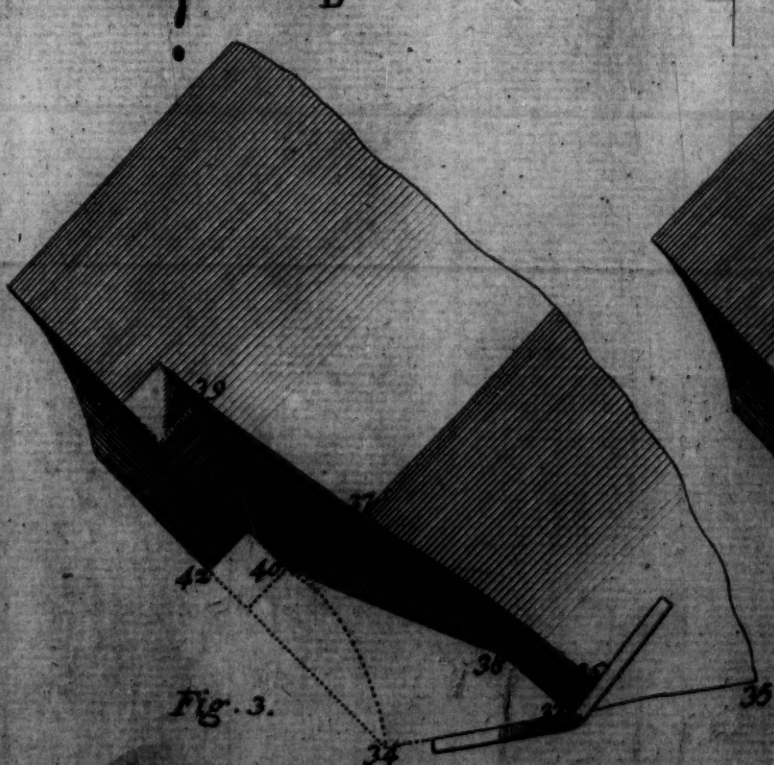
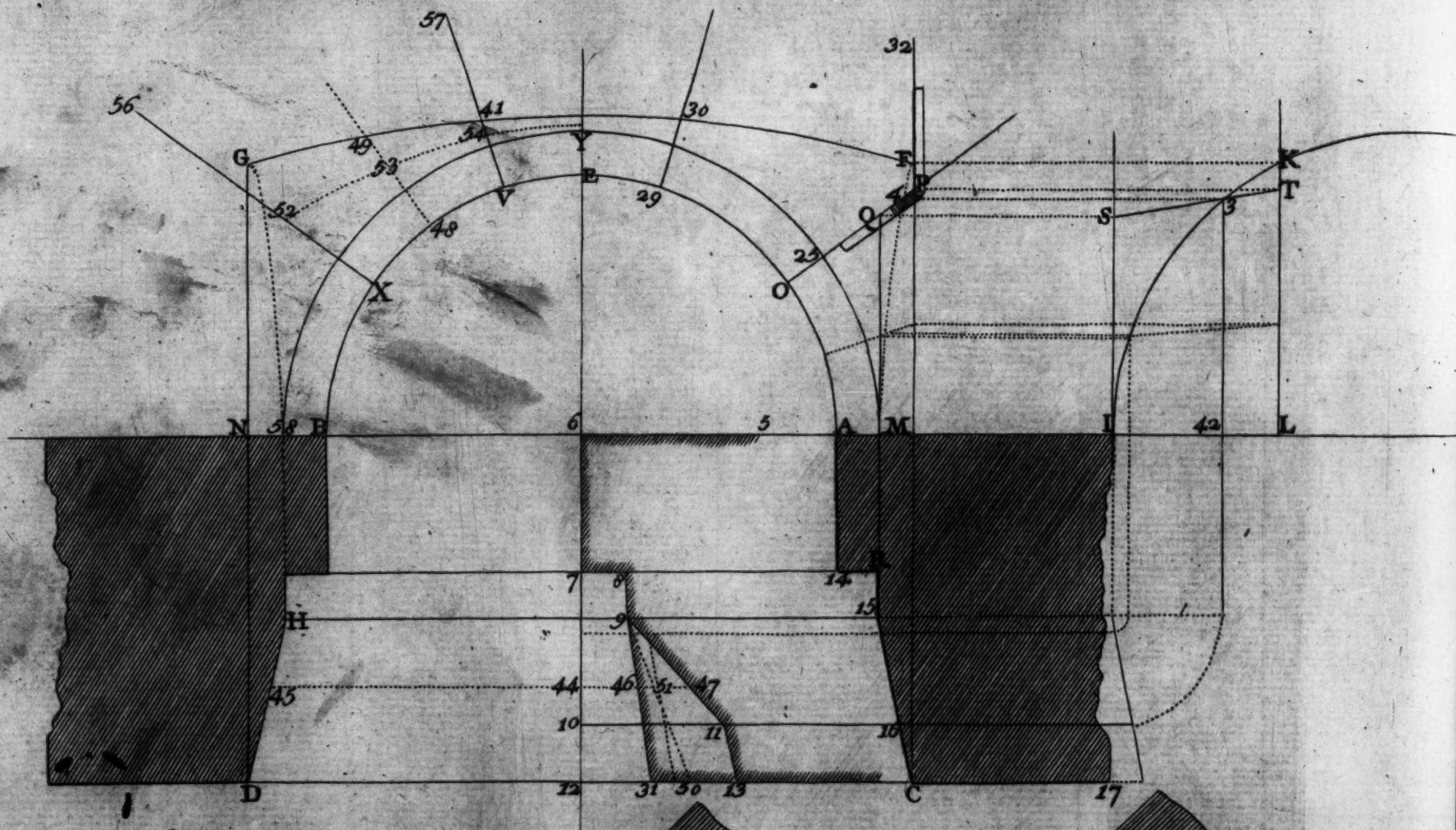


Fig. 3.

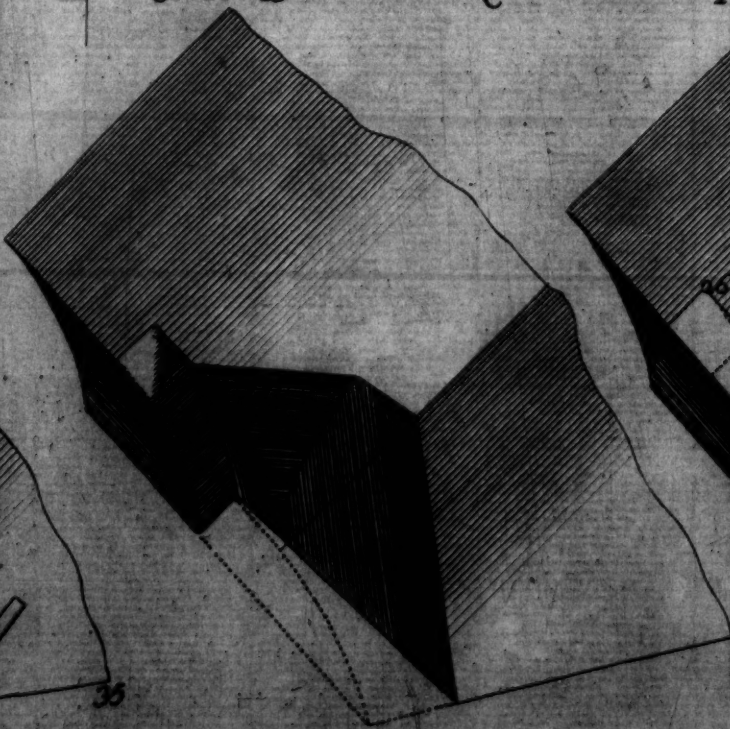


Fig. 2.

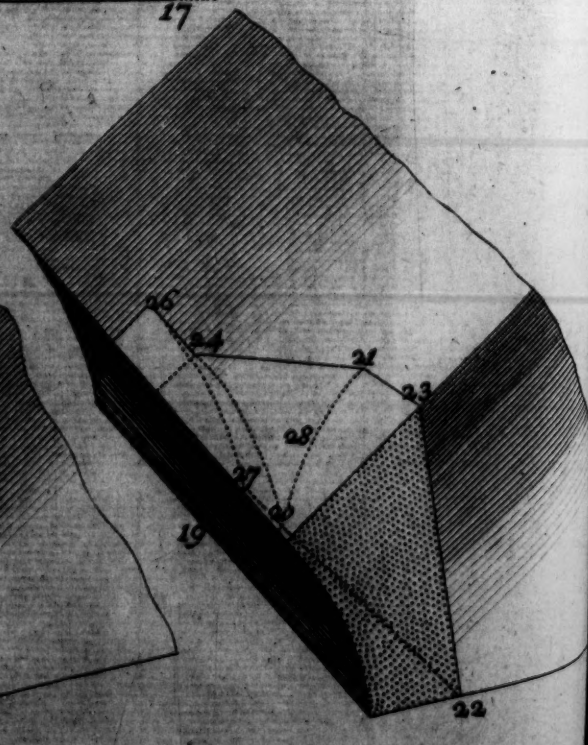


Fig. 1.

OF VOUSURES, OR

Of Gates revealed and splayed, and the Splays arched over with Segments, or Semicircles, springing from the Arch of the Gate.

CHAPTER XIX.

A Gate revealed and splayed, and the Splay, or Vousure, arched with a Segment. Pl. 18.

THE first of these Gates was made at *Marseilles* in *France*; from whence it is called by them the Gate of *Marseilles* by way of Distinction; its Use is to give Room for the Gates to open, when they are made the Height of the front Arch.

Let *A B C D* be the Plan, *A R* the depth of the Impost, *R I* the Reveal, and *I C* the Splay, inside describe the Arch of the Gate *A E B*, and that of the Reveal *M Y*; at the Extremity of the Splays *C* and *D* draw the Perpendiculars *C F*, *D G*, on which find the Points *F* and *G* in the following manner.

Describe the Arch of the Splay apart as *I K*; take the Interval *H D* or *I C*, transpose it on *I L*, and from the Point *L* raise the Perpendicular *L K* which will cut the Arch in the Point *K*; take the Height *L K* and lay it from *M* to *F* and from *N* to *G*; through the Points *F*, *G* trace the Arch *F G* as flat as necessary for the Gates to swing freely open.

The most compounded Joint in this Gate is *O P*, formed by the Arch of the Reveal and that of the Splay; to draw this joint Mould, from the Point *R* draw the Perpendicular *R Q* on *R I*, till it cut *O P* in the Point *Q*: draw the Line *Q S* parallel to *A I* till it cuts *I S*, and through the Point *P* the Parallel *P T* till it cuts the Line *L K*; through the Points *T* and *S*, draw the rampant Line *T S*, which cuts the Arch Line *I K* in the Point *3*, from which

which draw the dotted Line 3--4 parallel to LA till it cuts the joint Line OP, to find on OP the Point 4, (which is the Place where the Stone must make an Angle, shewn in the Elevation at the Point 55, and in the Trace of the joint Mould at the Point 11) draw the Line of the Impost 6--7, the Reveal 7--8--9, and having drawn the Perpendicular 3--42, lay the Distance 142 on 15--16, along the Splay, and thro' the Point 16 draw the Line 16--10 parallel to 15--H: lay the Distance O 4 on 10--11, and OP on 12--13 and draw the Lines 9--11 and 11--13. All the Joints which cut this forked Angle, are found in the same Manner.

For the Mould of the second Joint make 12--31 equal 29--30 and from the Point 9 (the Rear of the Reveal) draw the Line 9--31.

To cut one of the first Stones, with the Head Mould A O P I dress a Vouffoir like Fig. 1. whose Length is equal to 6--12: apply the Mould of the Plan I A R C 17 on the under Bed, and on the upper Bed the joint Mould 5--6--7--8--9--11--13--C; on the Sheeting Fig. 1. trace the Line 18--19 to mark the Thickness of the Impost, and on the Rear or Tail of the Stone, the Line 22--23 which represents the Line M P: then to hollow the Arch of the Reveal, with a Templet or curved Bevel M 25 trace the Curves 26--27 and 24--20; by the Lines 20--22, 22--23, 23--21 dress that Side which will be terminated by 21--28--20, making Use of a Templet or Curve cut by M 25, which apply from time to time, (as you waste the Stone) on 20--21 till at length there is formed the Fork 20--21--24, coming to nothing at 20, which being done, the Vouffoir will have the form of Fig. 2.

To trace the second Stone (represented Fig. 3.) with the Head Mould A O P I make a Vouffoir as before, on the under Bed of which apply the Joint Mould which served to trace the upper Bed of the last Stone, take the Joint Mould 5--6--7--8--9--31--C apply it to the upper Bed, and trace on the Sheeting the Line 43--42 which gives the Thickness of the Impost; with a Bevel take the obtuse Angle 25 P 32, lay it on the Rear Face or Tail of the Vouffoir on 33 (as in Fig. 3.) which is the mitring of the Joint Mould with the Arras 34--35: trace the Line 33--36 along the Leg of the Bevel, and lay the Height P F from the Trace, on 33--36 and with Templet cut to the Sweep E G, trace the Curve 36--37. Hollow the Arch of the Reveal as in the first Stone; and by a Ruler waste away the remaining Part of the Stone, according to the rear Arras of the Reveal 39--40, and that of the Rear of the Vouffoir 36--37, the end of the Face 33--36--38 will be made straight by the Ruler. To finish the Vouffoir, place the Templet of the Arch of the Reveal from 36 to 38, by which the Stone will be cut according to the Center. The Key is to be made in the same Manner, applying on each Joint the Mould 5--6--7--8--9--31--C; by which the Stone is to be cut, as explained in the other two Vouffoirs.

If the Wall be too thick for one Stone to go through, and it be necessary to make the second Vouffoir on each side of two Stones each, a Mould must be made to trace the Joint, which may be done in the Manner following.

Divide

Divide the Sheeting or Soffit V X into two equally, in the Point 48, and from the Center 6 draw the Joint 48—49: transpose the Interval 48—49 on 12—50, and draw the Line 9—50: that done, draw (at pleasure, or according to the Length of the Stones made Use of) the Line 47—45 parallel to 15 H; and work for the half Joint on the Arch I K as before; lay the Interval 44—46 on V 54; lay also the Distances 44—51 on 48—53 and 44—47 on X 52; trace the dotted Curve 52—53—54 which with the Lines 54—57 and 52—56 will form the Mould required.

As the Stones are here represented so as to shew the Application of the Lines, &c. the Moulds in the Trace do not agree with the corresponding Faces of the Stones this, we are obliged to do, to render the Views of the Stones intelligent to the Reader.

To trace one of the half Joints, separate the Bed and one of the Stones, take the thickness of the Wall A B which lay along the Face of the Stone and at each of the half Joints draw two others on the Bed, divide the two Arches with a Bevel take the middle Angle N A M, by which draw the two Arches, divide in themselves, on the upper Bed trace the Curve C, and on the Bed the Height a M, follow or work out the Sheeting with the Curve O M, and cut the Joints from the Sheeting-curves, that is, the Joint of the semi-circular Vault by the middle Angle A N, and that of the Passage by the Bevel G M.

The other Stones are cut in the same Manner, except that the Bevel G C is used to cut the Sweep of the semi-circular Stone, and the Bevel G D for the Bed, the Bed is to cut and intelligible as to require no other Explanation.

CHAPTER XX.

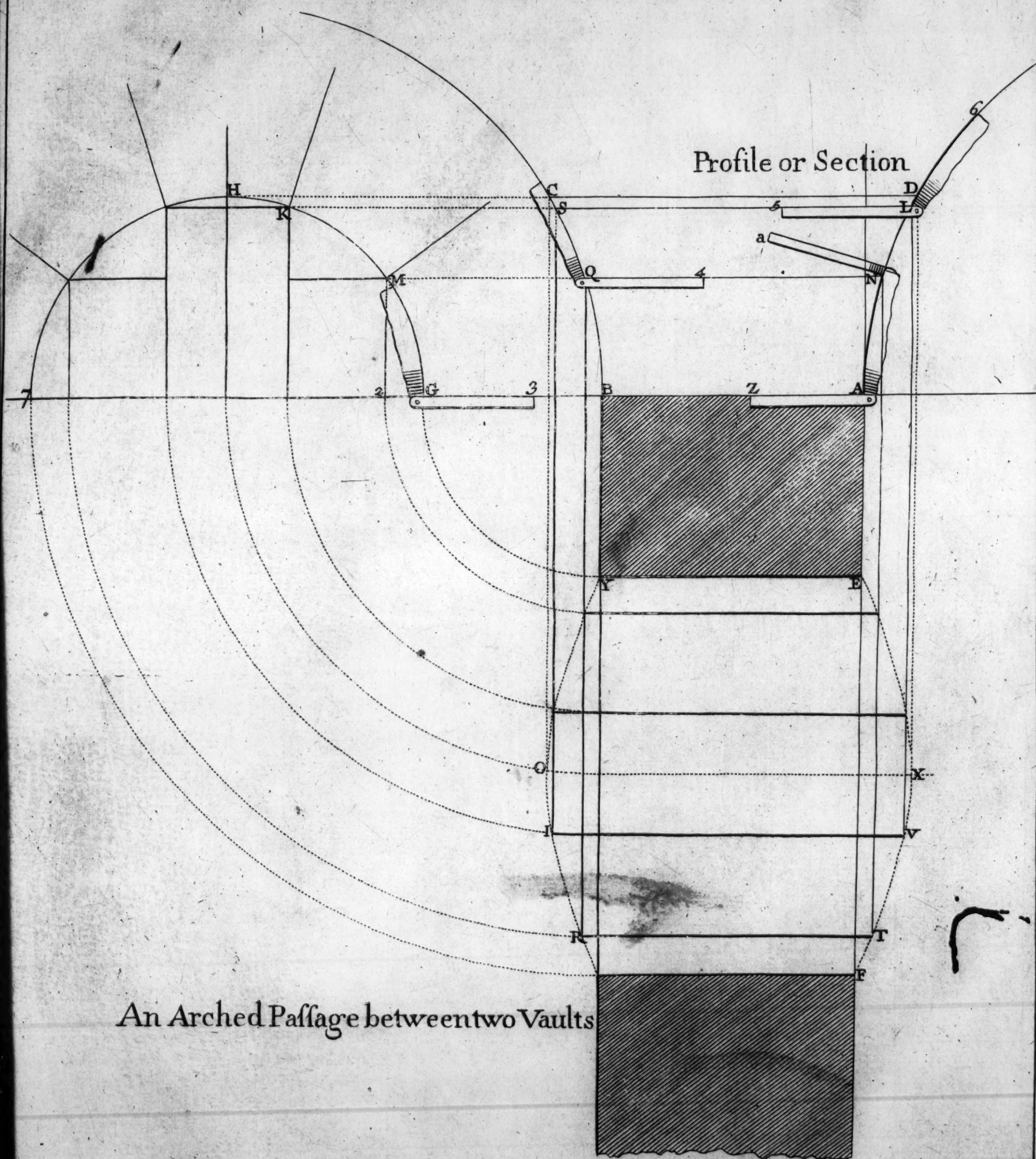
A Lunette, or Passage between two semi-circular arched Vaults, the Passage being also arched with a Semi-circle; traced by the Square. Pl. 19.

LET AB be the thickness of the Wall in which the Passage is to be made, BC, and CD the two semicircular Arches, EF the Ope of the Passage, by which the Arch GH is described, which divide into any Number of Voussoirs at Pleasure. Through the Points of Division, draw the Lines HD, KL, MN, which with the semicircular Arches will form mixt Angles, which serve to give to the Heads of the Voussoirs, the proper Projection, to intersect the semi-circular Vaults.

To distinguish in Plan, the meeting of the Lunette with the said semicircular Vaults, let fall the Perpendicular CO, SI, QR, &c. which by their intersecting, or meeting the Lines RT, IV, OX, &c. will give the Points RIO, &c. through which trace the Curves YOR and EXF.

To trace one of the first Voussoirs, square the Bed and one side of a Stone, take the thickness of the Wall AB, which lay along the Arras of the Stone, and at each of the said Lines, draw two others on the Bed, square to the Arras: with a Bevel take the mixt Angle ZAN, by which dress the two Heads, square in themselves: on the upper Bed trace the Chute G 2, and on the side the Height 2 M. Hollow or work out the Sheeting with the Curve GM, and cut the Joints square to the Sheeting-curves, that is, the Joint of the semi-circular Vault by the mixt Angle ANa, and that of the Passage by the Bevel 3 G M.

The other Stones are cut in the same Manner, except that the Bevel 4 QC is used to cut the Sweep of the second Stones, and the Bevel 5 L 6 for the Key, the rest is so easy and intelligible as to require no other Explanation.



PL 19

Section



7

RECEIVED
OFFICE OF THE
SHERIFF



7

The Gate, and Vousure of *S^t Anthony*,
the Vousure spherically arched.

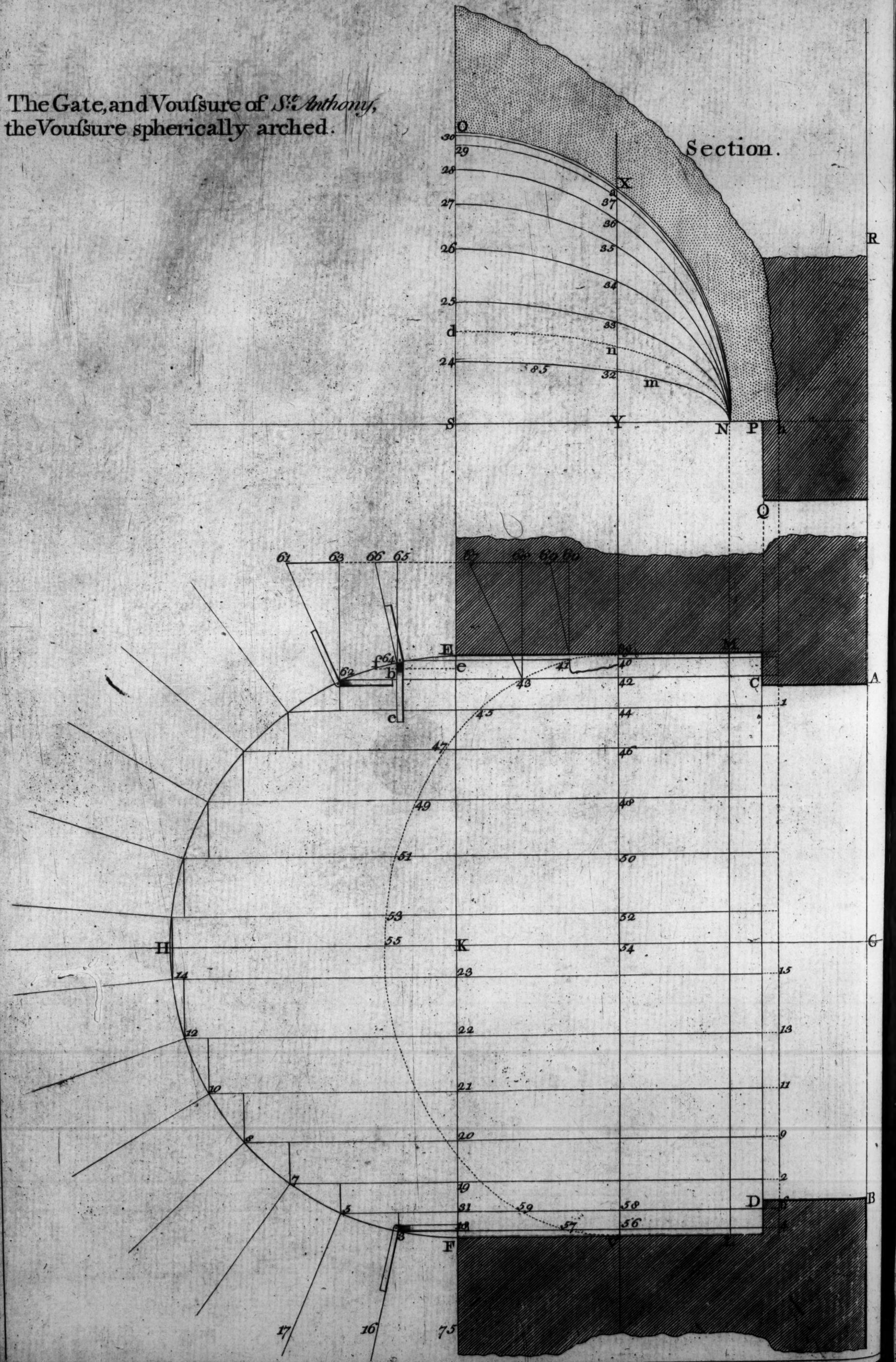




Fig. 1.

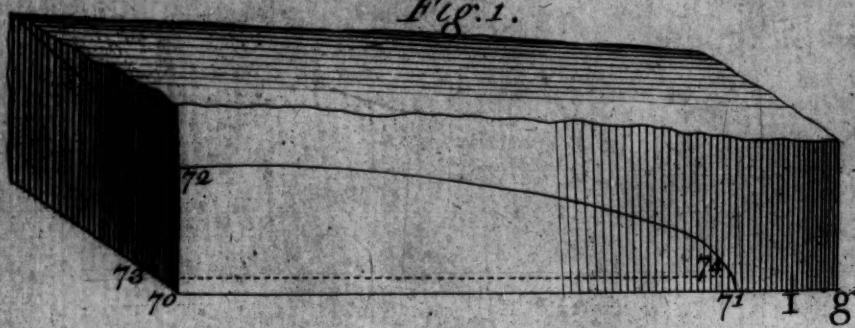


Fig. 2.

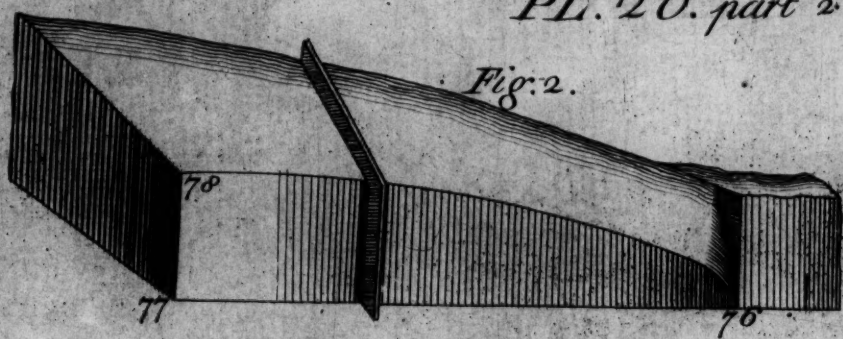


Fig. 3.

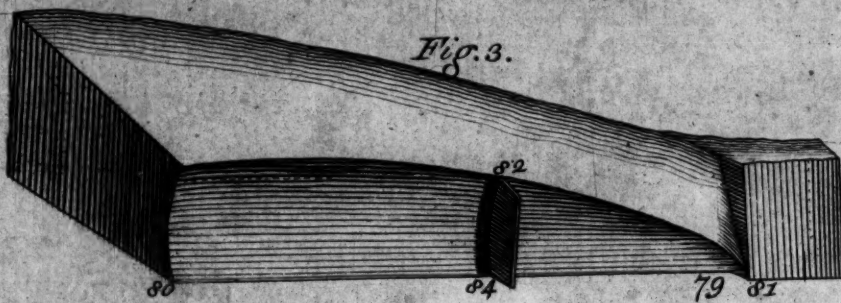


Fig. 4.

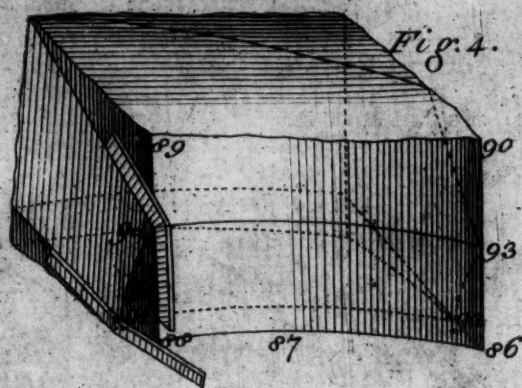


Fig. 5.

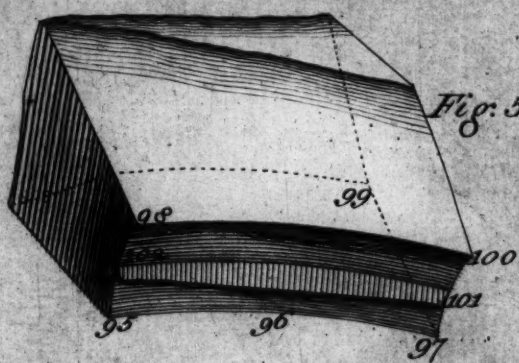


Fig. 6.

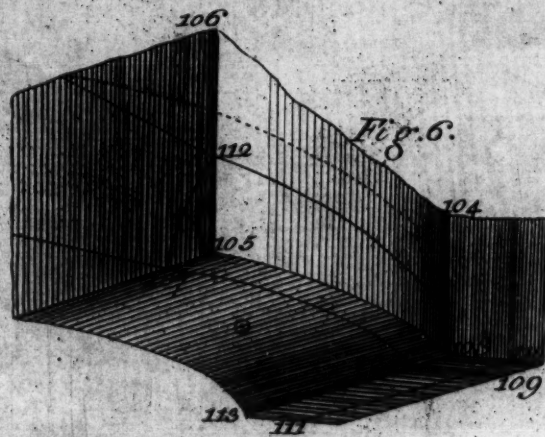


Fig. 7.

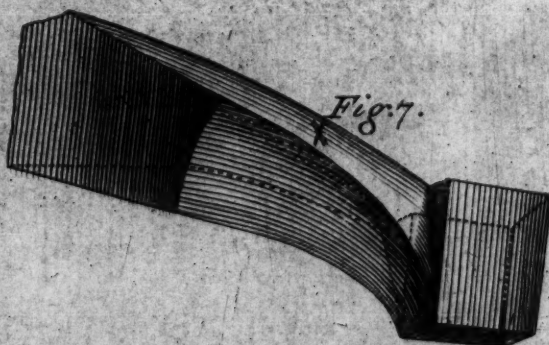
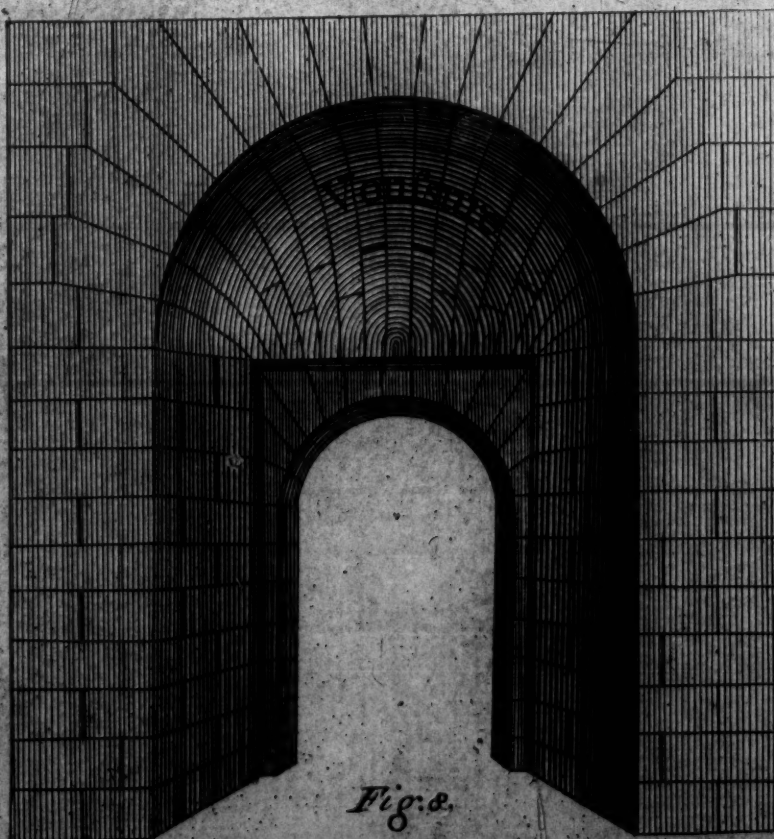


Fig. 8.



CHAPTER XXI.

Of the revealed Gate of St. Anthony, whose Voussure is spherically arched.
Pl. 20.

THE first of these Gates was constructed at the *Porte de St. Antoine* at *Paris*, from whence it took its Name; as this Gate is very rare to be met with, and many have not an Opportunity of studying the Construction on the Spot, we shall here give a particular Description of it.

The Voussures on the side of the great Arch, appearing of a more regular form than that of the Center, I shall treat only of one of those Voussures. The Wall in which the Retreat of this Gate is made is about six Feet and half thick; the Span of the Retreat is eight Feet, the Impost twenty Inches deep, and the Reveal six Inches: the Retreat has no Splay, but is parallel to the Impost, the Stones of the spherical Vault, or Arch do not correspond with those of the Center, or Arch which closes the Retreat in front, and make no Bondage together, except the Key. The Stones, of the Vault of the Retreat, (which for brevity, we shall henceforward call the Voussure) are composed of two and three Pieces, and butt upon those which form the small Arch in front, in such manner that the Voussure (*which comprehends the thickness, from the Quoin to the Impost, and about four or five Inches farther, to carry the Bottoms of the Voussours right over the Reveal*) and the Arch in front, (*whose thickness is twenty Inches*) are two Pieces placed one against the other, without Bondage, and in some Places without breaking Joint. To render the whole more intelligible, we have here given the Trace, according to the Dimensions before mentioned, and on the Profile is marked the meeting of the Voussures with the small Arch in front; which is easily distinguished, the first being dotted, and the last stroked with the Graver.

Let *ABCDEF* be the Plan of the Gate proposed: draw the Line *LM* parallel to *CD* and distant from it the depth of the Reveal; draw also the Line *1-2* parallel to *CD* to mark where the Stones of the Voussure advance on the Arch in front. From *G* the middle of *AB*, draw the Line *GH* perpendicular to *AB* from *K* the middle of *EF*, describe the Arch *FHE*, through the Points *EF*: divide this Arch into as many Parts as there are to be Voussours, suppose fifteen. Perpendicular to *CD*, through the Points of Division let fall the Lines *3-4*, *5-6*, *7-2*, *8-9*, *10-11*, &c. to the Line *1-2* draw also from the Point *K* as Center, the Joint Lines *3-16*, *5-17*, &c. through the Points *3-5-7-8*, &c.

Construction

Construction of the Profile.

Prolong the Lines FE towards O, LM towards N, DC towards P and AB to R; from the Point P taken at pleasure on DP, draw the Line PS perpendicular to EO. Transpose the Heights, 18-3 on S 24, 31-5 on S 25, 19-7 on S 26, 20-8 on S 27, 21-10 on S 28, 22-12 on S 29, 23-14 on S 30, and KH on SO. Through the Point N and the Points 24-25-26-27, &c. trace the quarter Ellipsis, as represented. Father *Derand* and some others use the Circle instead of the Ellipsis, but the Form of the Vouffure is much more graceful and regular, with the latter especially near the Reveals. The Height PQ which is here taken at pleasure, represents the Height, from the bottom of the Reveal under the Vouffure to the bottom of the Key-stone of the front Arch.

As the Vouffours must often be composed of many Pieces, when the Wall is thick, it is necessary to have Moulds to trace the Joints, for which Reason we shall shew the Manner of finding a Center, and its Joints, by a Section made in the Plan and Profile of the Vouffure or spherical Vault.

Suppose the Section to be made (agreeable to the Length of the Stones) in the Line V 39: prolong this Line across the Profile and its Ellipsis, to X, then transpose the Heights, viz. Y 32 on 40-41, and on 56-57, Y 33 on 42-43 and on 58-59, Y 34 on 44-45, Y 35 on 46-47, Y 36 on 48-49, Y 37 on 50-51, Y a on 52-53, Y X on 54-55, and through the Points 39-41-43-45-V 57-59, &c. trace the Center demanded 39-55-V.

But to have Joints thro' the Center, (which are the meeting of the Stones that compose one Vouffoir) through the Points 62-64, 43-41 draw the Lines 62-63, 64-65, 43-68, 41-60, parallel to SE, and to the Line 60-61: lay off the Heights 63-61 on 68-67, 65-66 on 60-69 and through the Points 43-67-41-69 draw the joint Lines 43-67 and 41-69, the rest are found by the same Method. Thus there must be as many Centers found, as there are Joints or Stones to compose one Vouffoir.

To trace a Sommer, see Fig. 1. dress the Bed of a Stone, and one Side square to it, and a Head square to both, take the Interval SN and lay it along the lower Arras of the Stone, on 70-71: make the Height 70-72 equal to S 24, or 18-3, with thin Oak or Deal, make a Mould or Templet to the Curve 24-32-N, and trace it on the side of the Stone, placing the Extremity N on 71 and the other on 72. Make the Interval 70-73 equal to 18 F, make a Head-mould to 75 F 3-16 and apply it on the Head of the Stone, so that the Extremity F be on the Point 73, and the Extremity 3 on 72: through the Point 73 trace on the Bed the Line 73-74 parallel to the Arras 70-71: by the Point 71 trace on the Bed, the Line 71-74 square to the Arras 70-71. The Space 71-i is the breadth of the Reveal, and ig the Bondage or Bedding of the Vouffure on the front Arch.

With a Bevel take the mixt Angle 18-3-16, by which cut the Joint of the Sommer, keeping the Legs of the Bevel perpendicular to the Arras 76-77

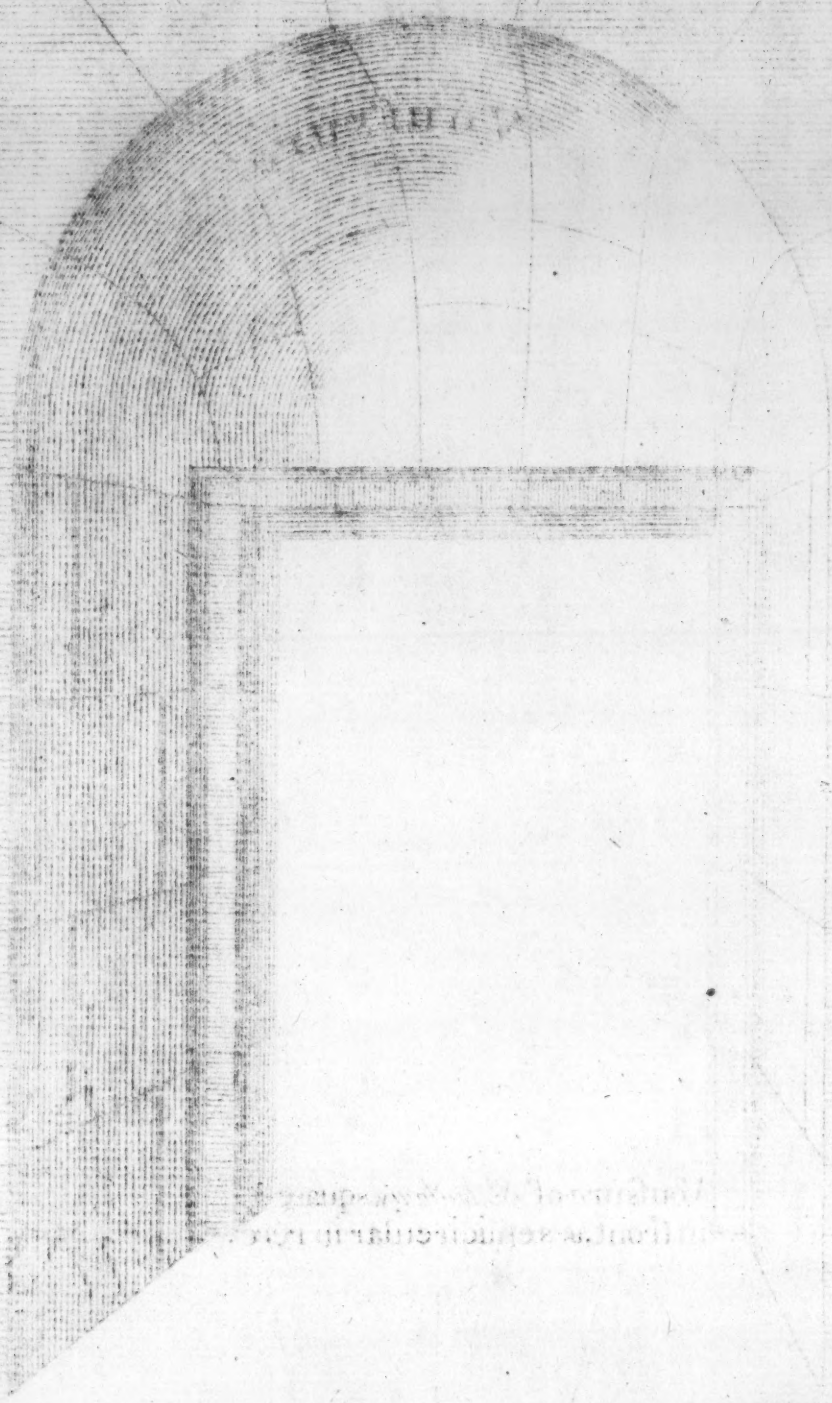
as is shewn in Fig. 2. then work out the Sheeting by the Curve 81--82--83 coming to nothing at the Arras 79--80, see Fig. 3. Having made the Interval 80--84 equal to SY, 83--82 equal to 24--32, with a Templet cut by 39--41, make a Channel to fit the Templet as at 84--82, and make several of these Channels at a Distance from each other, before you hollow the Stone, lest you waste it away too much, having a Templet cut by the Center for each. These Centers are of the same kind as the Center 39--55--V.

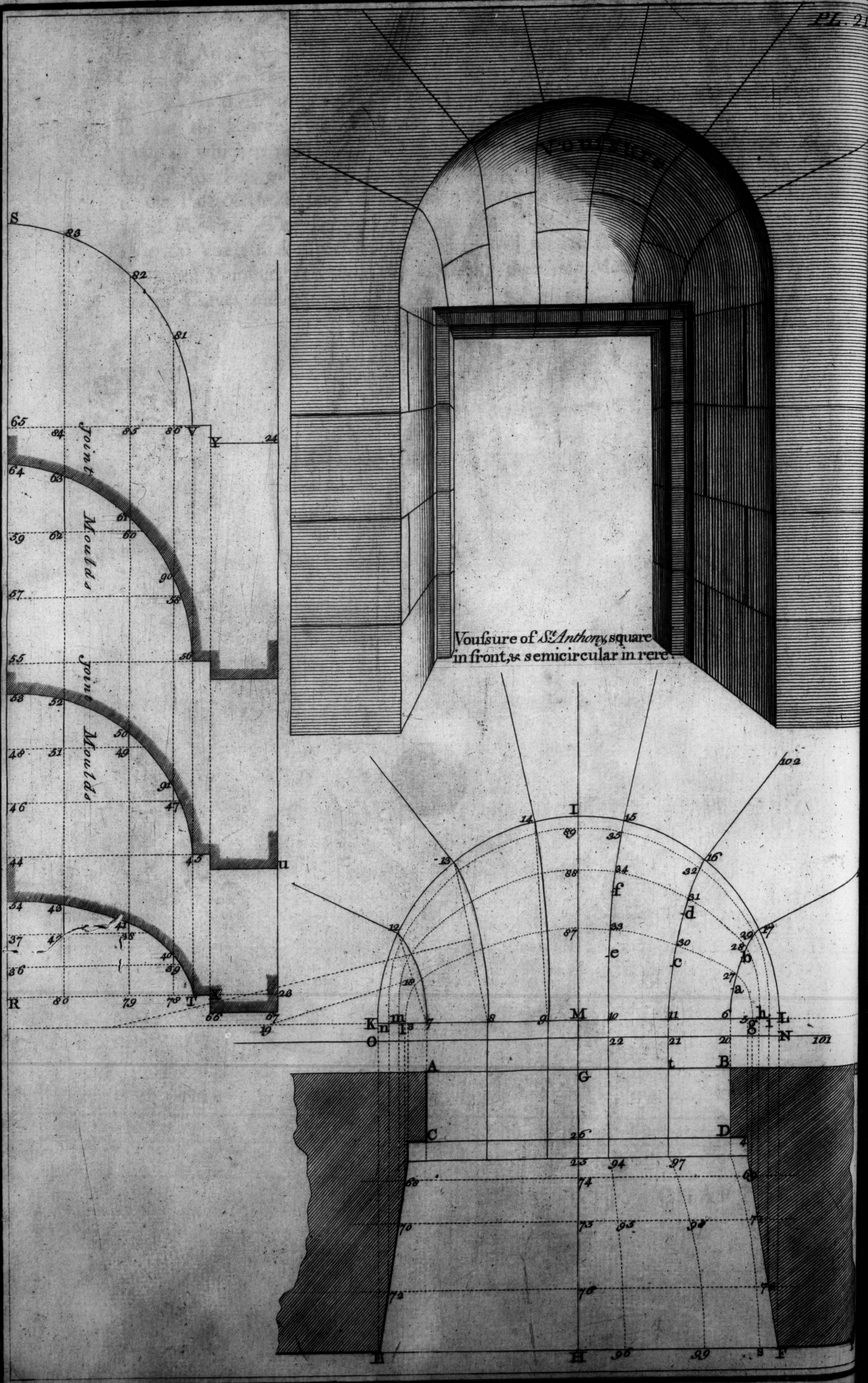
To trace that part of the second Vouffoir, from 24--25 to 32--33, to the Side of a Stone, (dressed as before directed) apply the Mould 26--24--85--32--34, see Fig. 4. Cut the Head, Joint, and the hollow Bed, square to the Side, that is the Head by the Trace 88--89, the Joint by 86--90 and the hollow Bed by the Curve 86--87--88: having marked on the Stone the Distances 88--91, 86--92 each equal to the Chute 64--b, trace on the hollow Bed, with a pliant Ruler, the Line 91--92, which represents the bottom Arras of the Sheeting. Transpose the Heights 24--25 (along the Arras 88--89) on 88--94, 32--33 on 86--93, then on the Side with a Templet cut to 25--33 trace the Curve 93--94 which represents the upper (centered) Arras of the Sheeting: apply the Mould 66--64--62--61 on the Head of the Stone, placing the Extremity 64 on the Point 91 and the Extremity 62 on the Point 94: apply also on the Joint the Mould 69--41--43--67 so that the Extremity 41 be on the Point 92, and the Extremity 43 on 93.

Make the upper Joint by the Angle b 62--61, and the under Joint, by the Angle c 64--66, as in Fig. 4. These Joints, or Beds, being made, the under one will be found hollow, and the upper one round. Hollow the Sheeting with Part of the Curve dn which proceeds from the middle of the Sheeting f, this Curve is to be found as those of the Sheeting N 24, N 25, &c. by carrying the Height ef on Sd, and by the Points Nd tracing a quarter Ellipsis, &c. observing to place the Templet of this Curve, in the Sheeting, according to the Inclination it ought to have. This Inclination is marked by the Line fe on the Sheeting 62--64, which is shewn also by the Templet 101--102 Fig. 5. where the Stone is finished.

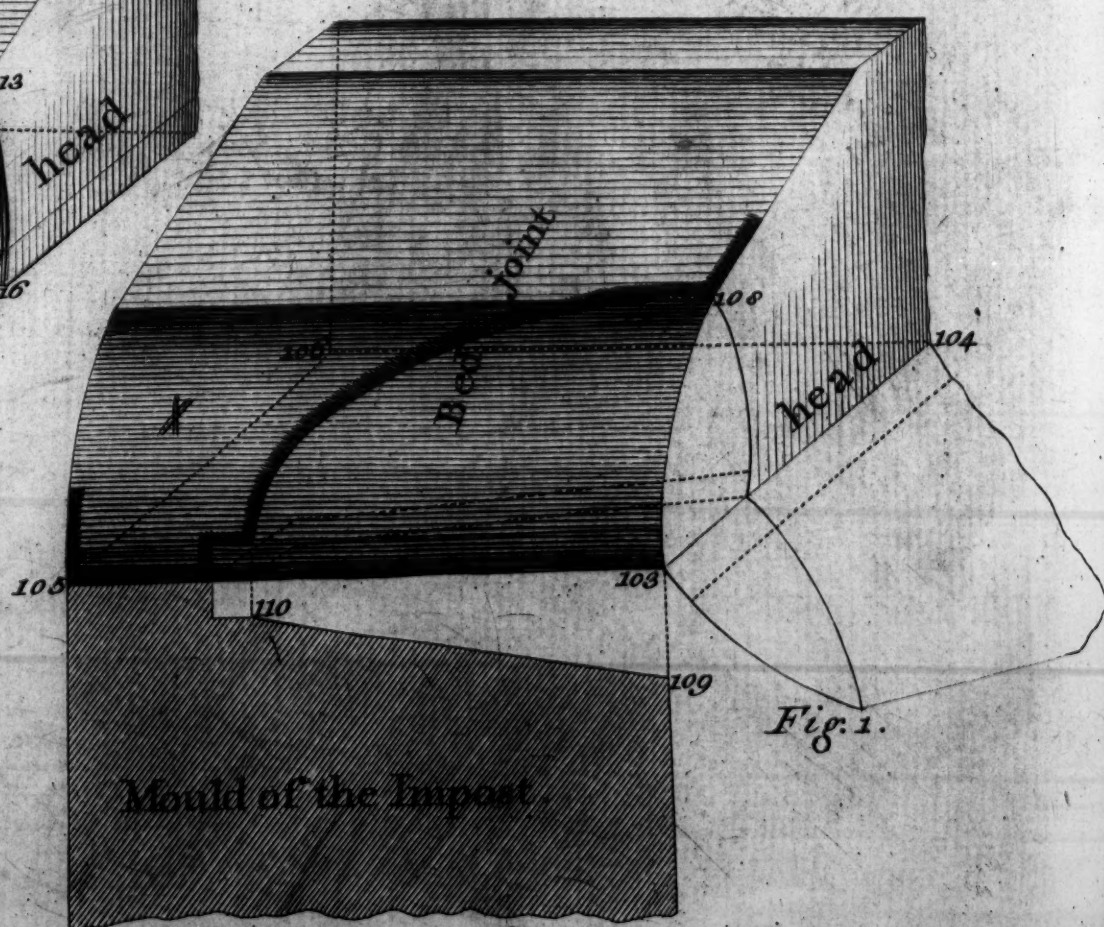
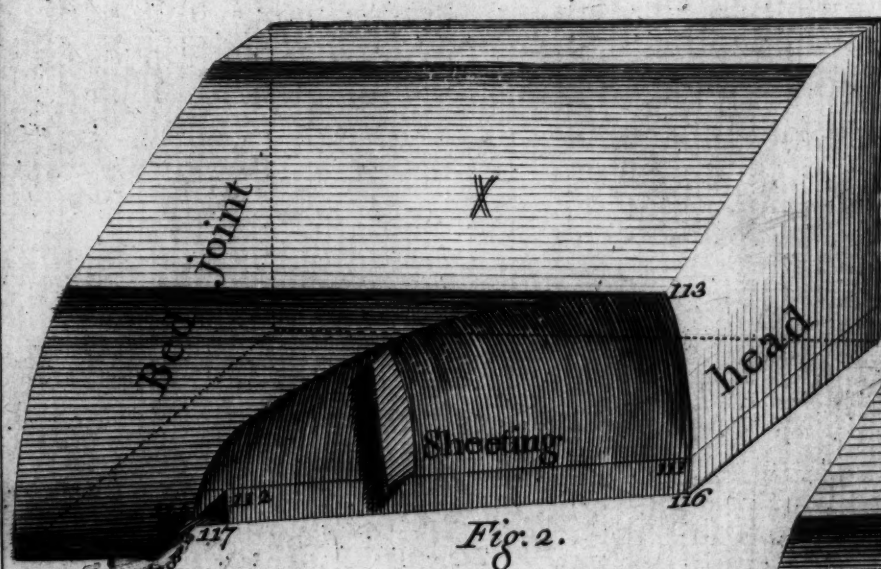
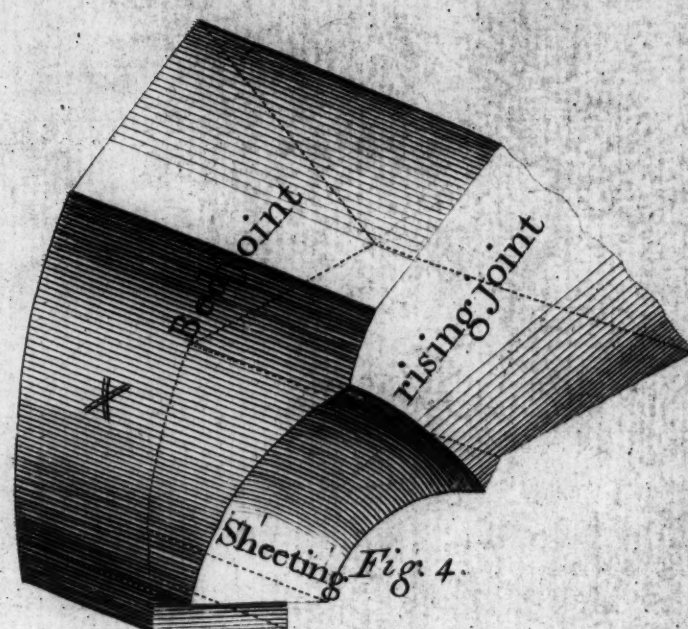
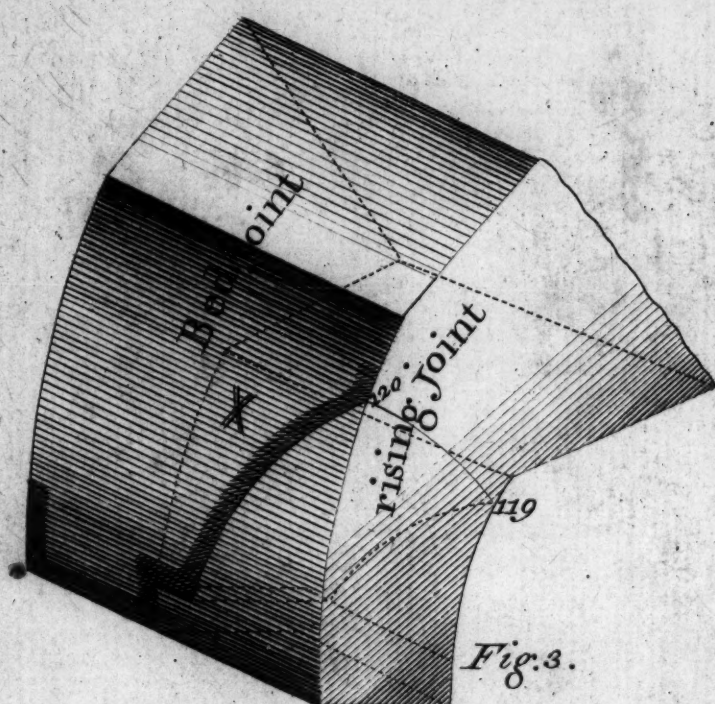
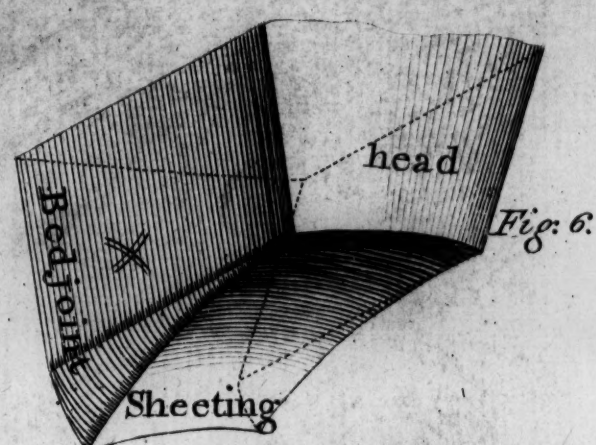
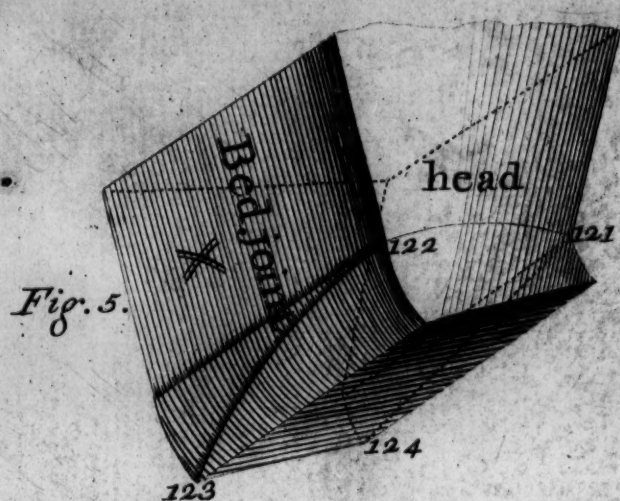
To trace the other part of the Vouffoir, from the Joint 32--33, and which terminates towards the Reveal, dress the Side of a Stone, on which trace the Mould h N m 32--34. Make the under Bed by the Curve N m 32 and the straight Part Nh square to the Side; making also the rising Joint square to the Side, by the side of the Mould 32--34, see the Profile, and the Stone will be in form of Fig. 6. Through the Point 103 trace on the side, the Line 103--104 parallel to the Arras 105--106: transpose the Chute b 64 on 105--107 and on 103--108, then on the curved Part of the Bed trace with a pliant Ruler, the Line 107--108. Through the Point 108 on the straight Part of the Bed, trace the Line 108--109 parallel to the Arras 103--110. Make the Interval 103--110 equal to the Depth of the Reveal Np and through the Point 110 trace 110--111 parallel to the Arras 103--113. Lay off the Height of the Chute 32--33 a-
M long

long the Arras 105—106 on 105—112, and apply it on the side Part of the Curve N 33, so that the Extremity N be on the Point 103 and the Extremity 33 on the Point 112. On the Joint apply the Mould 69—41²—43—67 so that the Extremity 41 be on the Point 107 and the End 43 on the Point 112, all which is represented in Fig. 6. Cut the Joints and hollow the Sheet-
ing of this Part of the Vouffoir, as shewn before for the other Part, observing to use Part of the dotted Curve Nn, and we shall have the Vouffoir finished as in Fig. 7. The eighth Figure represents the Gate and its Vouffure or spherical Vault in Perspective.——Practice will render the tracing and cutting the other Vouffoirs very easy, by following the same Method, and using the proper Curves and Moulds.









CHAPTER XXII.

St. Anthony's Gate square in Front, with splayed Retreats, and a semi-circular Vouffure. Pl. 21.

THIS Gate differs from the preceding in three Things; first, it is straight arched in front; secondly, the Joints are curved, and thirdly, the Vouffours of the Vouffure correspond with those of the front Arch; consequently the Work can be well bonded together.

Let ABCDEF be the Plan; through G the middle of AB draw HI perpendicular to AB; draw the Line KL parallel to AB at Distance at pleasure. Through the Points E, F draw the Lines EK and FL parallel to HM till they meet the Line KL; from M the middle of KL and through the Points K, L describe the Semi-circle KIL, which divide into seven Parts (or as many as required). From the Center M, through the Points of Division, draw the Joints 17-100, 16-102, &c. Prolong the Lines of the Imposts CA, DB to the Line KL, to find the Points 7 and 6. Divide the Interval 6-7 into five equal Parts 7-8, 8-9, 9-10, &c. (observe that if the Arch KIL be divided into nine Parts, the Interval must be divided into 7, that is two less, and so of any other Number).

Through the Points 7-12, 8-13, 9-14, 10-15, &c. describe circular Arcs, whose Centers are to be found in manner following.

Through the Points 7-12 draw the Line 7-12; through the middle of 7-12 draw the Line 18-19 perpendicular to 7-12, prolonging it, till it cuts the Line KL in the Point 19, which is the Center of the Arc 7-12: The Centers of the Arcs 8-13, 9-14, &c. are to be found on the Line KL by the same Method.

Through the Points 2-4 draw the Lines 2-3, 4-5 parallel to HM till they meet the Line KL; draw the Line NO parallel to KL, and distant from it the Line C 2, the Breadth of the Reveal; through the Points 6-11, 10, &c. let fall the Lines 6-20, 11-21, 10-22, &c. perpendicular to NO.

Construction of the Joint-moulds, for the vaulting of the Vouffure.

Draw the Line 23-24, on which raise the Perpendicular 23 R at pleasure; lay the Distances G 26 on 23 X, G 25 on 23 T, and GH on 23 R; then through the Points XTR draw the Lines XY, TV, and RS, parallel to 23-24: lengthen the Arches, 6-27-17, 10-30-16, 10-33-15, by dividing the Arch 6-27-17 into three equal Parts, 6a, ab, b 17, and laying off 6a on R 36, ab on 36-37 6-17 on 37-54: then through the
Points

Points T and 54, trace the quarter Ellipsis T—41—54. Having made the Interval X—66 equal to XT, or to 6—20 draw the Line 66—67 parallel to RT; through the Point 44, taken at pleasure on the Line RS draw the Line 44—45, parallel to RT; divide the Arch 11—30—16 into three equal Parts 11c, cd, d16; lay the Distances 11c, on 44—46, cd on 46—48 d16 on 48—53, and through the Points 45—53 draw the quarter Ellipsis 47—50—53.

Through the Point 55 taken at pleasure on RS, draw the Line 55—56 parallel to RT; divide the Arch 10—33—15 into three Parts, 10e, ef, f15; lay 10e on 55—57, ef on 57—59, f15 on 59—64; and through the Points 56—64 describe the quarter Ellipsis 56—61—64. Through the Point 65 taken at pleasure on RS, draw the Line 65 V parallel to 55—56, lay the Interval MI on 65 S, and through the Points VS trace the quarter Ellipsis VS. These Arches may be divided into more than three Parts, the greater Number of Divisions, the more exact will be the Mould.

To find the Centers necessary to trace the hollow of the Sheeting in the Joints, whose Plans are represented by the Lines 68—69, 70—71, &c.

When the Vouffoirs are of many Peices draw at discretion the Lines 68—69, 70—71, 72—73 parallel to AB; lay the Distances 25—74 on T 78, 25—75 on T 79, 25—76 on T 80, then through the Points 78—79—80 draw the Lines 78—81, 79—82, 80—83 parallel to RS. Through the Points 36—37—46—48—57—59 draw the Lines 36—39, 37—38, 46—47, 48—49, 57—58, 59—60, parallel to TR.

To find the Center to the Line 68—69, make the Distances Mg and Ml, each equal to 74—69; lay the Distances 39—40 on a 27, 47—91 on c 30, 58—90 on e 33 (the same on the other Side) and 86—81 on M 87; then through the Points g—27—30—33—87, &c. trace the required Center g—87—l.

To find the Center to the Line 70—71 make the Distances Mh and Mm, each equal to 75—71, lay off the Distances 38—41, on b—28, 49—50 on d—31, 60—61 on f 34, 85—82 on M 88, &c. and through the Points h—28—31—34—88, &c. trace the Center demanded h—88—m.

To find the Center to the Line 72—73 make the Distances Mi and Mm each equal to 76—73; lay the Distances 42—43 on b—29, 59—52 on d—32, 62—63 on f 35, 84—83 on M—89, &c. and through the Points i—29—32—89, &c. trace the Center i—89—n. By this Method as many Centers may be found as thought needful.

The Curves 94—95—96—97—98—99, &c. serve only to express the Plans of the Joints of the Sheeting of the Vouffure.

To

To trace the Sommer, which must be placed on the Impost 9 B D F r, dress the Bed of a Stone, on which trace the Plan of the Impost: square the two Ends to the Sides B 9 and Fr, and to these Ends apply the Mould 101--20--27--17--100, placing its Sides 20--101 along the Arras 103--104, 105--106, having made the Joint partly round and partly straight, as represented in Fig. 1. apply on the top, the Curve, or Mould-joint, 44--54, 41--T--X--66--67, so that the End 54, be on the Point 108, and the End 67 on the Point 105 as in Fig. 1. make a small Part of the Side square to the Bed, (according to the Splay of the Retreat 109--110) as deep as the Reveal, (observing not to cut in upon the Sheeting.) Work out the Reveal as in Fig. 2. Draw the Line 111--112 parallel to the Arras 116--117 and distant from the Arras the depth of the Reveal 118--115: which done hollow the Sheeting by the Curve 113--114--115 coming to nothing at the Line 111--112. To hollow the Sheeting with Exactness, use Templets cut to the Curves i--29, h 28, g 27, which apply on the Sheeting as in Fig. 2. at the Distances of said Curves found before, which will be given on the Trace 111--112, by the Points 69--71--73, and on the Curve 113--114--115 by the Points 40--41--43.

To cut the first Vouffoir after the Sommer, and to be composed of two Stones, determine the Length from the Front B T to the Joint 71--98; dress the Side of a Stone on which apply the Head-mould 100--17--27--6--20--21--11--30--16--102, by which cut the Beds, and one Side, square to the first: And to give the Stone its proper Length, which is expressed by the Interval G 75, make a Side parallel and opposite to the first, then the Stone will be like that represented in Fig. 3. On the under Bed apply the Joint-mould 67--66--X--T--40--41 and on the upper Bed the Joint-mould 45--91--50: on the Joint (whose Plan is represented by the Line 71--98) apply the Mould 100--17--28--31--16--102, so that the Extremity 28 be on the Point 119 and the Extremity 31 falls directly on the Point 120. Make the Reveal and hollow the Sheeting as shewn before in the Sommer, using the Curves 27--30, &c. which done this part of the Vouffoir will be finished as in Fig. 4. To cut the second Part of this Vouffoir which reaches to the Rear, and whose Plan is 71--98--s--99, dress the Side of a Stone on which apply the Mould 100--17--28--31--16--102 by which dress the Beds and a side square to the first, according to the Interval 75 H, and the Stone will be formed as in Fig. 5.

Apply to the under Bed, Part of the Mould 41--54--44, so that the Extremity 41 be on the Point 124 and the Extremity 54 on the Point 121; on the upper Bed apply Part of the Plan 50--53--55, so that the Point 50 falls on the Point 123 and the Point 53 on the Point 122; on the Face of the Stone which forms the rear front of the Vouffure, trace the Curve 17--16 so that the Extremity 17 be on the Point 121, and the Extremity 16 on the Point 122. On the Joint (whose Plan is the Line 71--98) trace the Curve 28--31 so that the Extremity 28 be on the Point 124, and 31 on the Point 123, hollow the Sheeting as explained before, and the Stone will be finished as in Figure 6. What has been said, being sufficient to understand the tracing and cutting of the rest, it is needless to take up more Time and Room in the Explanation of them.

CHAPTER XXIII.

St. Anthony's Gate, with a segmented Vouffure, and straight Sheeting or Soffit, butting a semi-circular Vault. Pl. 22.

LET ABCD be the Plan; divide the Interval CD into two equal Parts in E, through which draw FG perpendicular to CD; describe the Arch CFD through the Points C, D, segmented at pleasure, describe the Crown or Extrados HIK; continue the Lines of the Imposts AN, BO to the Arch CFD; divide the Part of the Circle NO into three equal Parts and draw the joint Lines of the Arch CFD; through the Points PRTX, &c. draw the Lines PQ, RS, TV, XY, &c. parallel to FG; then to find the Joints of the Plat-band, in front, draw the Line 6 S, parallel to AB, and distant the breadth of the Reveal: make 3 V equal to 5 T, 2 Y equal to 4 X, and draw the Lines QV and 6 Y; repeat the same on the other side.

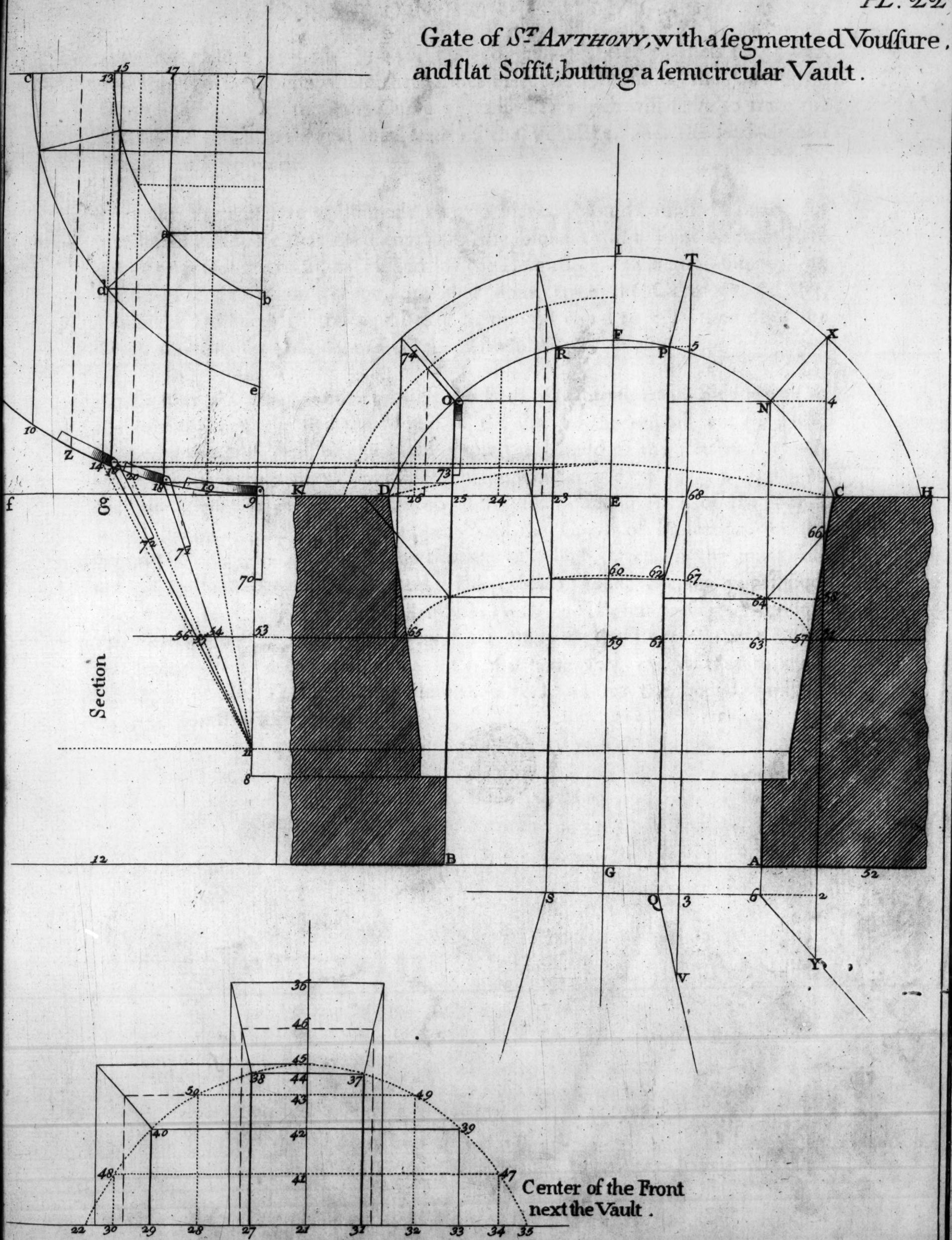
To draw the Section, prolong the front and rear Lines of the Plan, as also of the Reveal: draw the Perpendicular 7--8 at pleasure; on the Point 7 (taken at pleasure on 7--8) draw the Perpendicular 7--13, on which lay the Heights of the Chutes of the Arches CFD, HIK, and through the Points 13--15--17, &c. draw Lines parallel to 9--7, which terminate by the Arch of the Vault in the Points 14--16--18, &c. Through the Points of the Sheeting Curves 18--16--14, &c. to the Point 11 (which represents the Rear of the Reveal) draw the sloping Lines of the Soffit 14--11, 16--11, 18--11, &c.

The Trace of the Arch ba 13, and edc and the Lines which cross them (as 15--16, 17--18, &c.) might have been avoided, by laying on the Line 9 f, the Heights of the Chutes of the Arches CFD, for Example EF on 9 g, and then through the Points g and 11 trace a Line which would have cut the semi-circular Vault towards the Point Z, and so with the rest of the Heights of the Chutes: but we have here only worked in that manner to fix on the semi-circular Vault, the Height of the Vouffure.

To draw the Butting of the Vouffure on the Vault.

Draw the Line 35--22 on which lay the Chutes of the Arches CDF, HIK, viz. E 23 on 21--27 and on 21--31, E 24 on 21--28 and on 21--32, E 25 on 21--29 and on 21--33, E 26 on 21--30 and on 21--34, ED on 21--22 and 21--35, then draw the Lines 21--36, 31--37, 27--38, 29--40, 33--39, &c. perpendicular to 35--22; lay the Distances 9--19 on 21--41, 19--18 on 41--42, 18--20 on 42--43, 20--16 on 43--44, 16--14 on 44--45, 14 Z on 45--46, and Z 10 on 46--36; and through the Points 41--42--43--44, &c. draw

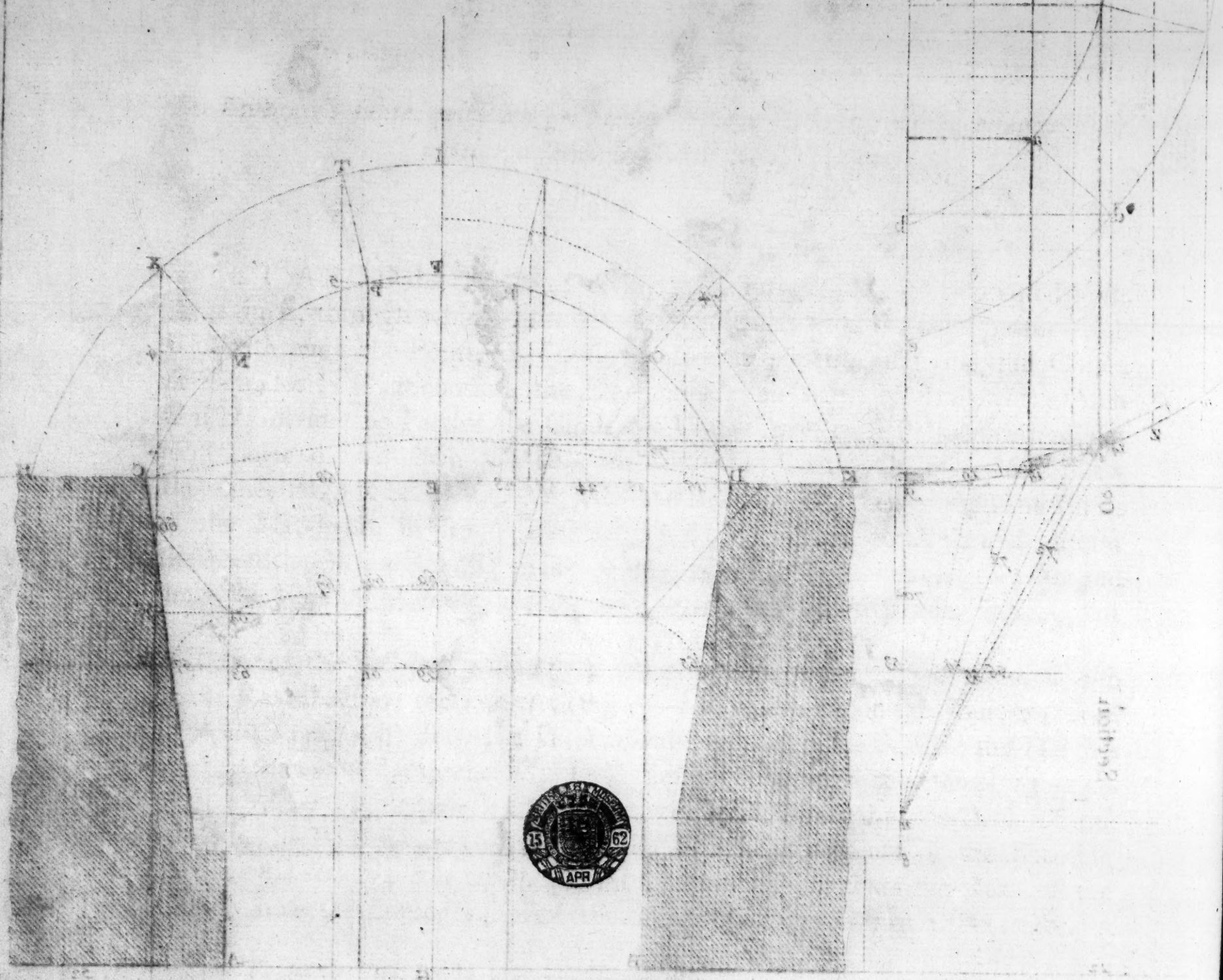
Gate of *S^T ANTHONY*, with a segmented Vouffure,
and flat Soffit, butting a semicircular Vault.



Center of the Front
next the Vault .

PL. 22

Table of the various ways of determining the
center of the vault.



Center of the vault
next the vault

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

draw the Lines 47-48, 39-40, 49-50, 37-38, &c. parallels to 35-22, and through the Points where these Lines meet the Plumbs of the Chutes, as in 47-39-49, &c. trace the Curve 35-45-22, which will serve to trace the Curves of the Sheeting on the Heads of the Voussoirs, after the semi-circular Vault shall be made.

If the Voussoirs are to be made of two Pieces, Moulds must be made for the Joints; suppose that the Length of the Stone to the Joint be from E to 51-65, prolong 51-65 to 56 and lay the Heights 53-54 on 63-64, 53-55 on 61-62, 53-56 on 59-60, &c. that done, trace the Curve 57-60-65, make the Distances 58-66 equal to 4 X, 67-68 equal to 5 T, then draw the Joints 64-66, 62-68, and so of the rest.

To trace and cut a Sommer, dress the Bed of a Stone and a Side square to it, then apply on the Bed the Mould of the Plan of the Impost, cut the Head square to the Bed, and to the Head apply the Mould of the Platband 52-A-6-Y, and with a Bevel having taken the mixt Angle 70-9-19, apply to the rear Face, to give it the sweep of the semi-circular Arch of the Vault, which being cut, apply on the upper Part, the Curve of Projection, or the butting Curve 22-48-40, from the top of which, trace on the inner side a Line to the Rear of the Reveal, which being done, cut the upper Bed, joint-wise, by the said Line on the Side, with the Bevel 73 O 74: hollow the Sheeting by a Ruler, dying away to nothing at the Rear of the Reveal; the second Part, and the Key are done the same way, except that to trace the Arch of the Vault, use the Bevels 71-18-20 for the second, and 72-16-Z for the Key.

CHAPTER XXIV.

St. Anthony's Gate, bevelled in Rear, the Voussure segmented, and Sheeting curved. Pl. 23.

THE Plan ABCD being given, as also the Bevel DE, draw FH parallel to AB, and distant the breadth of the Reveal, through the Points C and D, draw the Lines CF, DH, parallel to IG, till they cut FH; thro' the Points FH describe the Arch FGH segmented at pleasure. Divide the Platband AB into three equal Parts, and draw at discretion the Joints AL, MN, OP, BQ, but so that they do not form too acute Angles with the Line AB; from the Points ALMNOPBQ let fall the Lines L 7, A 8, N 9, M 10, O 11, &c. perpendicular to CD.

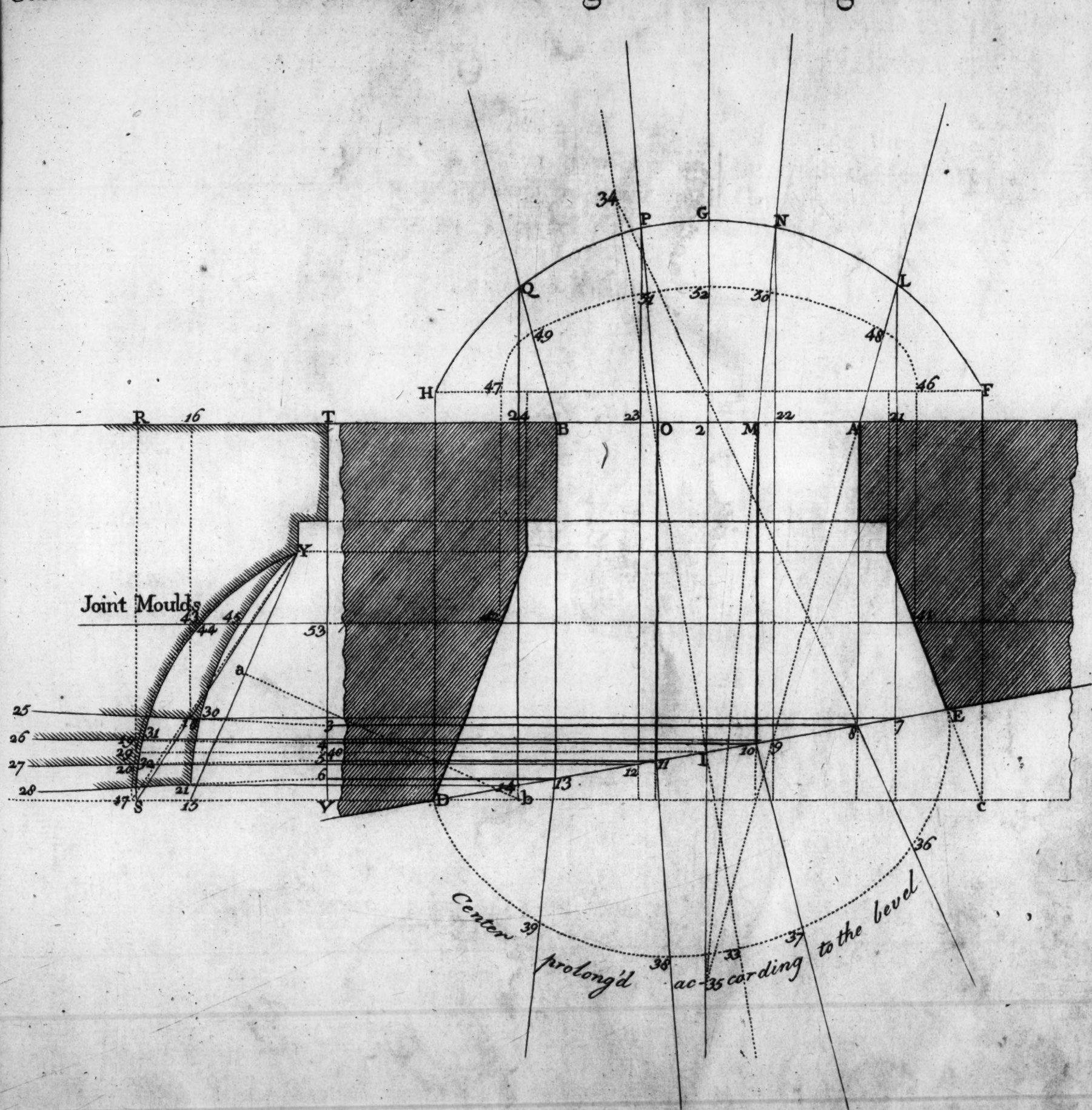
To find the Joint-moulds prolong AB to R, and CD to S: prolong also the Lines of the Impost, and those of the Reveal, then draw at pleasure the Line TV perpendicular to BR and having formed the Reveal Y, make the Distances V 15 equal to BQ, VS equal to OP, V 17 equal to 2 G: Through the Points 15 and S draw the Lines 15-16, SR, parallel to VT. Through the Point Y and the Points 15-S-17, describe the Arcs of a Circle Y-45-15, Y-44-S, &c. whose Centers are found by drawing from the Point Y to the Points 15. S. 17. the Lines Y-15, YS, &c. from a the middle of Y 15, draw a b perpendicular to Y 15, and prolong it till it cuts the Line SC in the Point b which is the Center, from whence through the Points Y 15, the Arch Y-45-15 is described---the other Centers are found on the Line Sc by the same Method.

But as the Bevel of the Rere, takes off some Part of the Plan, the Voussure must also be taken off as much, and the Joint-moulds must also have the same Bevel, which is done in manner following.

Lay A 8 on T 3, M 10 on T 4, O 11 on T 5, B 13 on T 6: lay also 21-7 on 16-18, 22-9 on R 19, 23-12 on R 20, and 24-14 on 16-21, then through the Points 3 and 18 draw the Line 30-25; through the Points 4 and 19 draw the Line 31-26: through 5 and 20, draw the Line 32-27: through 6 and 21, draw 21-28: through I, draw I 29 parallel to BR, until it meets the Arch Y-43-17 in the Point 29.

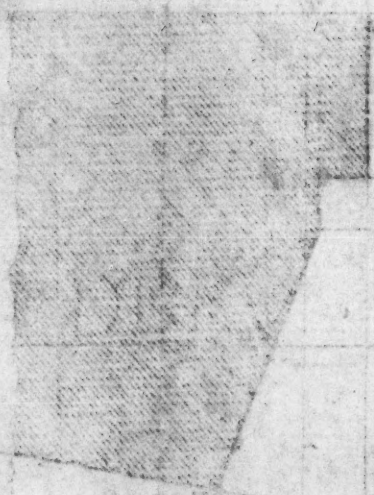
To construct the Center of the Rere Face according to the Bevel, through the point I, draw the Line 33-34 perpendicular to ED, and having made the Interval I 34 equal to 2 35, (which Point 35 is the Center from which the

Gate of *STANTHONY*, beveld in Rere, the Vouffure segmented and Sheeting curved. PL. 23



PL. 93

of the



...

...

the Joints AL, MN, &c. are drawn) from 34 through 8-10-11-13 draw the Joints 8-36, 10-37, 11-38, 13-39, then lay 3-30 on 8-36, 4-31 on 10-37, 40-29 on 11-38, 5-32 on 13-39, and 6-21 on 13-39, then through the Points E 36-37-33, trace the Curve of the required Center E 33 D.

To trace the Center of the Sheeting by the middle Joint 41-42, prolong 41-42 to 43, through the Points 41-42, draw 41-46 and 42-47 parallel to IG, to cut FH; and having made A 48 and B 49 equal to 53-45, M 50, and O 51 equal to 53-44, make 2-52 equal to 53-43 and trace the Curve 46-52-47.

We shall say nothing in this Chapter of forming and cutting the Stones, the Examples and Explanations already given are sufficient, with the least Application, to render the Practice familiar to the meanest Capacity.

END of the FIRST PART.

